

ANNUAL REPORTS
OF THE
DEPARTMENT OF
AGRICULTURE

FOR THE YEAR ENDED JUNE 30,

1911.

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REPORT OF THE
SECRETARY OF AGRICULTURE.

REPORTS OF CHIEFS.



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[AN ACT providing for the public printing and binding and the distribution of public documents.]

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Section 73, paragraph 2:

The Annual Report of the Secretary of Agriculture shall hereafter be submitted and printed in two parts, as follows: Part One, which shall contain purely business and executive matter which it is necessary for the Secretary to submit to the President and Congress; Part Two, which shall contain such reports from the different bureaus and divisions, and such papers prepared by their special agents, accompanied by suitable illustrations, as shall, in the opinion of the Secretary, be specially suited to interest and instruct the farmers of the country, and to include a general report of the operations of the department for their information. There shall be printed of Part One, one thousand copies for the Senate, two thousand copies for the House, and three thousand copies for the Department of Agriculture; and of Part Two, one hundred and ten thousand copies for the use of the Senate, three hundred and sixty thousand copies for the use of the House of Representatives, and thirty thousand copies for the use of the Department of Agriculture, the illustrations for the same to be executed under the supervision of the Public Printer, in accordance with directions of the Joint Committee on Printing, said illustrations to be subject to the approval of the Secretary of Agriculture; and the title of each of the said parts shall be such as to show that such part is complete in itself.

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REPORT OF THE SECRETARY OF AGRICULTURE.

REPORT

OF THE

SECRETARY OF AGRICULTURE.

Mr. PRESIDENT:

I respectfully present my Fifteenth Annual Report, covering the work of the Department of Agriculture for the year 1911.

BRIEF COMMENTS.

When the cattle-fever tick is destroyed in the Southern States the country will get much more meat from that section and the producing of it will build up the farms there.

The hog-cholera serum developed in this department is successful where it is properly made and applied.

Would it be asking too much of our universities to have them educate more plant pathologists and road engineers?

Every country in the world that has diseased plants that can not be sold at home can ship them to us. This results in great loss. The chestnut disease here is an illustration.

After years of experimentation we find we can grow Egyptian cotton in southern California and bulbs in the State of Washington.

The finest dates from the Sahara Desert succeed in our Southwest.

No seed is sent out from this department without being tested for germination condition.

The schools want more of our publications than we have to give them.

Seven hundred and fifty million dollars is the best estimate for poultry products this year.

The day is not far distant when we will cease to import potash.

A serious pest in the South is the crayfish; carbon bisulphid is a sure remedy.

We are sending explorers to the ends of the earth for new plants—and getting them.

The phosphates are abundant in our country for all possible uses. Florida, Kentucky, Tennessee, and Idaho may be mentioned as depositories.

If good roads from the producer to the consumer were general, the benefits to both would be considerable.

When a foreign insect invades, our scientists seek its enemy where it came from. The natural enemy of the boll weevil was an ant that could not endure our winters, but the native ant is getting busy.

The experiment stations of the several States are doing better work each succeeding year; the scientists are maturing and the people are appreciating.

The object lesson in agriculture is the best teacher; we had 60,000 of them at work last year.

Six hundred thousand short tons of beet sugar were made last year in 67 factories. There is an estimated world's shortage of 1,600,000 long tons of sugar this year.

The consumer pays a dollar for food; the farmer gets less than fifty cents for it. Who gets the rest?

All Government agencies that conserve public health should be grouped together in one bureau.

The Department of Agriculture has had success in the Southern States through object lessons in the fields, where the best southern farmers in their counties were the instructors. This method should be organized in all the States along lines of greatest necessity.

Our systems of renting land are faulty and result in soil robbing; where the renter can not provide domestic animals, the owner should arrange to furnish them so that rotation of crops may be had, and hay and grains may be fed on the farm.

Irrigation will bring maximum crops while the land is new and full of plant food; but, where the crops are sold year by year, irrigation will not of itself assure good results.

Alaska will some day provide farmers in lower latitudes with grain seeds superior to what they can grow at home.

The corn crop is moving northward by seed selection.

The southern farm boy is showing the way to grow more of all crops on an acre.

Educate the farmer's boy toward a more valuable life on the farm.

Uplift the farm home through the education of the farmer's daughter toward greater usefulness and attractiveness in the farm home.

Save all the liquid fertilizers on the farm, in cisterns, to be applied where crops are to grow; this will recover the greatest farm waste of our times.

There is great promise in the fact that whole classes of graduates of agricultural colleges go back to the farms, having learned how to make them profitable.

Our foresters are learning by experiments how to reforest 30,000 acres in a year; ten times as much must be planted annually to cover all the bare acres in a generation. It will be done.

There should be publicity regarding the cold storage of foods, through monthly reports to some Federal authority that would give them to the press, to the end that the people might know to what extent foods were being withdrawn from consumption.

CROP RESULTS.

ADVERSE CLIMATIC CONDITIONS.

EXCEEDING ALL RECORDS.

The climatic conditions of the early part of the growing season of 1911 were adverse to agriculture throughout the country east of the Rocky Mountains in a degree that exceeds all records. The assertion has been made that this country is so large in extent and has such a varied climate, soil, and crops that no nation-wide calamity can befall its farmers from natural causes. An extreme test of the truth of this assertion was made this year.

From early in May until July was well advanced, a period of about 60 days, a series of hot waves of marked severity so early in the summer followed one another in rapid succession over nearly the entire regions of the Mississippi Valley and the Atlantic coast.

Short periods of more moderate weather occurred locally at intervals, giving some relief, but, it is stated by the Weather Bureau, it is probable that during no previous similar period of 60 days has the temperature been so continuously and largely above the average over so extensive a region in the last half century.

Deficient rainfall made this continuous heat effective against crop production. From January to June the rainfall in Minnesota, Iowa, and Missouri was 19.7 per cent below the normal; it was 25.4 per cent below in North Dakota, South Dakota, Nebraska, and Kansas; 27.8 per cent below in New England; 12.4 per cent below in New York, New Jersey, and Pennsylvania. In the South Central States east of the Mississippi River the deficiency of rainfall from January to June was 10.3 per cent; west of that river, 21.6 per cent; and in the Pacific Northwest, 21.2 per cent.

This combination of drought and heat was the severest test to which the crops of the immense area covered have been subjected during the many years covered by records.

Yet 1911 is not a lean year. Enough has been produced for the national needs, and there will be a surplus.

COMPARISON UNFAVORABLE TO 1911.

CROP PRODUCTION.

Most of the crops of 1911, as far as their production is ascertained, compare unfavorably with the average production of the preceding five years. Cotton is the most conspicuous exception. If the commercial expectations of the size of this crop are realized, it will be one-quarter larger than the five-year average, and also the largest cotton crop ever grown.

The sugar-beet crop is much above the average production of the previous five years, and is the largest ever grown, while rice and buckwheat are considerably above.

All other crops are below the five-year average in production, hay being the most prominent one in percentage of deficiency.

VALUE OF WEALTH PRODUCED.

For the first time in many years the total value of farm products has declined from that of the preceding year. The estimate for 1911 is based on the census items and is \$8,417,000,000, or \$277,000,000 under the total for 1910. The loss is chargeable to the general classes of animal products and animals sold and slaughtered. Dairy cows are the only farm animals for which increase of price is indicated. Eggs, wool, butter, and poultry have likewise suffered in farm price during the year. In consequence of the decline of prices of farm animals and their products, this group is estimated as having produced a value of \$2,913,000,000 in 1911, or \$321,000,000 below the amount for 1910.

On the other hand, the crops are worth more than those of 1910, the estimate of farm value being \$5,504,000,000, a gain of \$44,000,000 over 1910. Farm prices of all crops are higher than for 1910, except for cotton, cotton seed, and flaxseed, and this general fact, notwithstanding the other general fact that production was low, makes about 10 crops of 1911 the most valuable ones of the same kinds that the farms of this country have ever produced.

If the census value of farm products for 1899 is represented by 100, the relative standing of subsequent years can be readily perceived if they also are represented by index numbers. After 1899 the total value of farm products increased yearly about 5 to 7 in the index number for six years, ending with 1905. For 1906 the in-

crease was 10, for 1907 it was 15, for 1909 it was 16, for 1910 the increase was less than 2, and for this year there is a loss of 6 in the index number. At the end of six years after 1899, or the year 1905, the index number had risen from 100 to 133; in five years more it mounted to 183; and the highest point reached is 184.3 for 1910. The number for 1911 is 178.4. The progression was broken by this year, so that two other years, 1909 and 1910, exceed 1911 in the value of the wealth produced on farms.

Little is known of the total agricultural wealth production of foreign countries, but the little that is known affords interesting comparisons. A rough but official estimate of the value of the wealth produced by agriculture in Italy in 1910, a year of large production, is \$1,351,000,000. Official returns of the production in Japan, averaged for the three years 1905-1907, give an annual value of a little more than \$613,000,000. The official yearbook of the Commonwealth of Australia reports for 1908 a value of \$184,000,000. According to the Canadian census of 1901 the value of the farm products of the foregoing year was \$363,000,000; the census of 1911 has not yet published the corresponding figures for 1910, but the annual official report of agriculture indicates a present production valued at about \$900,000,000.

CHIEF CROPS.

In the statement that follows concerning the crop quantities and values for 1911 no figures should be accepted as anticipating the final estimates of this department, to be made later. Only approximations can be adopted, such as could be made by any competent person outside of this department. All values are for products at the farm, unless otherwise stated, and in no item are values at the produce or commercial exchange.

CORN.

With a value more than twice that of the cotton crop this year, and but little less than the combined values of the cotton, wheat, and oats crops, corn is by far the leading crop as a wealth producer. The estimate of 2,776,000,000 bushels indicates a production that has been exceeded in only two years, but it is a little under the average for the preceding five years.

The farm price of corn is now higher than it has been since the records of the department began in 1866, except in 1883, and this establishes a total value for the crop that reaches \$1,700,000,000 and breaks the record.

So preeminently is corn the leading crop of this country that about three-quarters of the world's crop is grown here. For the five years 1905-1909 the percentage is 76.2.

While the exports of corn as such from this country are small when comparison is made with the size of the crop, they averaged 67,400,000 bushels during the five years 1906-1910, and constitute one-third of the world's exports of corn.

This crop has secured a greater importance in national economy because of the multiplication of its uses. Formerly a feed for animals and as meal or hominy a food for man, it is now made into varied food products and finds numerous industrial uses, largely due to the work of the chemist.

COTTON.

That a large crop may be worth less to the producers than a small one is exemplified by the cotton crop of this year. Commonly supposed to be the largest one ever grown, this crop has reached a price that is 5 cents a pound of lint below that of last year, when the crop was much less in quantity, and for the same reason the price of seed has declined. Apparently, the value of the fiber and seed of this year's crop will not exceed \$775,000,000, an amount that is below that of two former crops, although above the average of the preceding five years.

There is no crop that this country produces that excites such world-wide interest as cotton, for the reason that the crop of the United States is about three-fifths of the world's production, contributes two-thirds of the world's exports, and has a fiber of a sort that has no direct competition in other countries.

It is raw cotton, much more than any other commodity, that makes this country's export value loom large. This fiber contributes about one-half of the value of agricultural exports, and more than a quarter of that of all exports. During the fiscal year 1911, for the first time in history, the value of the exported cotton not only passed the half-billion mark, but reached the amount of \$585,000,000, or \$148,000,000 more than the average of the five preceding years.

HAY.

The considerable failure of the hay crop has caused an increase of farm price of only about \$2.50 per ton over that of 1910. With a production of only 47,000,000 tons this year, this crop is far below the five-year average yield of 63,500,000 tons, and was exceeded by the crop of 1884 and every year since 1888.

The farm value of this year's crop, however, is slightly above the five-year average. In the case of some other kind of crop, three-quarters of the usual production would cause a much greater relative increase of price than is found in this crop, and the reasons why the hay price has not responded in greater degree are probably the good

and late fall pasturage and the existence of a great deal of roughage to take the place of hay. The value of the crop is placed at a little less than \$700,000,000, and this is \$50,000,000 more than the assumed value of the cotton lint produced this year, and \$100,000,000 more than the value of the wheat crop. These comparisons emphasize the importance of the hay crop, an importance that is not generally recognized off the farm.

WHEAT.

Fourth in order of value is the wheat crop, worth about \$600,000,000, or a trifle below the five-year average and also below the value of the wheat crop of three other years. The farm price of wheat per bushel is a little above what it was last year, but is considerably below the price of 1909.

In production, the wheat crop of this year is $5\frac{1}{2}$ per cent below the five-year average, and has been exceeded by that of every year since 1897, except in five years. The estimate of the department places the production at 656,000,000 bushels, an amount that would have been much exceeded had the weather conditions been favorable.

This country produced one-fifth of the world's wheat crop during the last five years, and contributed about one-eighth of the world's exports.

OATS.

The oats crop is invariably fifth in order of value, and this year is worth about \$380,000,000, or 5 per cent more than the five-year average. This amount has been perceptibly exceeded in only one year. The farm price is about 10 cents a bushel higher than it was last year, on account of the deficient production.

The yield of this crop is estimated to be 874,000,000 bushels, a low amount caused by adverse weather. This was exceeded by the crop of every year since 1901, except three years. The oats crop of 1909 and of 1910 was more than a billion bushels. About one-fourth of the world's oats are grown in this country.

POTATOES.

The early prospect of an almost complete failure of the potato crop was not fully realized and the crop was ascertained to be 282,000,000 bushels, a production that was exceeded in seven years, and was 12 per cent below the five-year average.

Although the crop was about 90 per cent of the average production, the farm price increased 20 cents a bushel, or to about 75 cents, with the result that the total value of the crop is the highest of record, and amounts to \$213,000,000, or 14 per cent above the five-year average.

BARLEY.

Barley is another crop deficient in production. The 146,000,000 bushels of this year's crop are 12 per cent below the five-year average, and also below the production of every year since 1905. But the total value of the crop is about \$125,000,000, and much above the record value of 1907. This is because the farm price rose to about 85 cents a bushel, far above the price for every year since 1881, when it was 82.3 cents, and, with the exception of that year, far above the price for every year since 1874, when it was 86 cents. Since the record of the farm price of barley began in this department in 1866 the price of this year's crop per bushel has been exceeded in only three years.

TOBACCO.

The tobacco crop is 2 per cent under the five-year average in production and 5.3 under in value. From 1906 to 1909 the farm price of tobacco ranged from 10 to 10.3 cents a pound; in 1910 it was 9.3 cents; and for this year there is apparently an increase of a fraction of a cent. Previous to 1906, when the 10-cent price was first reached since 1887, there was a period during which there was a general complaint among tobacco growers that the price was too low, if not unprofitable.

The crop of this year is estimated to be about 800,000,000 pounds, worth about \$76,000,000. The production has been larger in seven years and the total value in two years.

The tobacco grown in this country during the last five years is 31 per cent of the world's crop and supplied other countries with a quantity that is 42.3 per cent of the world's exports of tobacco.

FLAXSEED.

The flaxseed crop of 22,000,000 bushels has a farm value of about \$47,000,000. The amount of the crop is $7\frac{1}{2}$ per cent under the five-year average, and the total value makes the extraordinary comparison of 53 per cent above the five-year average. This is because the farm price increased from \$1.01 in 1906 to \$1.53 in 1909, to \$2.31 in 1910, and to about \$2.17 in 1911. The production of this year has been exceeded many times, but the total value has never been equaled.

RYE.

With the lowest production since 1901, except three years, the rye crop of about 31,000,000 bushels is 5.4 per cent below the five-year average. Its value, on the contrary, is the highest ever reached and is 12.2 per cent above the five-year average. Its farm value of about 83 cents a bushel is the highest since 1868, except 1881. The total value is \$26,000,000.

SUGAR BEETS.

The sugar-beet crop, which for several years remained close to \$20,000,000 in value, has risen to more than \$24,000,000 this year, an increase of $23\frac{1}{2}$ per cent above the five-year average and much above the previous highest value. The production also is the largest and is 23.7 per cent above the five-year average. To the establishment and growth of this crop this department has directed some of its best efforts.

HOPS.

No other crop exhibits such a high increase of value over the five-year average as the hop crop does. It is 140 per cent. This is because the price of hops, which has usually been 10 to 20 cents a pound, has risen to about 38 cents. Consequently the total crop value has become \$15,500,000. The production, on the other hand, has fallen off by 15 per cent in comparison with the five-year average and has been exceeded many times.

Nearly one-fourth of the world's exports of hops go from this country, and a little over one-fourth of the world's crop is produced here.

RICE.

Rice is one of the five crops that have a production above the five-year average, the percentage being 6.6. The amount, although a little over 1,000,000,000 pounds, has been exceeded twice. The price per barrel has been down until within a very few weeks, and it is probable that the value of the crop, as finally determined, will be larger than was expected.

BUCKWHEAT.

Buckwheat continues to show a disposition to reach its old-time production after many years of decline. The crop of this year is 7.3 per cent above the five-year average and has been exceeded by only two crops since the sixties. The total value is the largest since the sixties and is above the five-year average by 13 per cent. The farm price is about 72 cents a bushel, and in only one year since 1883, namely, in 1908, has the price been higher.

TOTAL OF ALL CEREALS.

Notwithstanding the considerable differences among the cereals, a comparison of the total of all of them this year with the five-year average will be some sort of a measure of the year's performance in agriculture. The bushels of cereals produced this year number 4,522,000,000. This is 3.4 per cent below the five-year average and,

while it indicates that the agricultural year of 1911 was below par, it is far from indicating any degree of calamity. If the great cotton crop be taken into account, the total crop production is below the average in a less degree than the cereals suggest.

SUGAR.

Sugar making belongs to manufacturing and not to agriculture, yet cane and beet production can best be treated through the sugar made from them. The refined beet sugar made this year nearly equals 600,000 short tons, the largest amount ever made by about 80,000 tons. This is about 24 per cent more than the five-year average. The value has, of course, soared and amounts to about \$90,000,000, including value of pulp, the highest previous value being about \$60,000,000 for 1909. It is 81 per cent above the five-year average.

The cane-sugar production of 1911 is estimated to be about 380,000 short tons of raw sugar, or about $5\frac{1}{2}$ per cent above the five-year average production, but yet an amount that has been exceeded several years. The value is about \$45,000,000, which is far above the highest figure ever before reached and is 58 per cent over the five-year average.

Both kinds of sugar combined, the production equals about 975,000 short tons, or about 85,000 tons more than the record production of 1909. The factory value of this sugar and the beet pulp, which is used for feeding purposes, is about \$135,000,000, or about \$41,000,000 more than the value of the two kinds of sugar for 1909, the year next to 1911 in order of value.

SUMMARY OF COMPARISONS.

The year 1911 was a poor one for record-breaking crops, since the list includes only cotton and sugar beets. In these cases, however, the achievements are memorable, because of the great increases over the production that was previously highest.

Apart from these two crops, not a crop reaches a place that is next to the highest production of former years; corn and rice win third place, and buckwheat third place since the sixties; the total of all cereals occupies fifth place, and the other crops are farther down the scale.

The tale is reversed when the values of the crops are considered. The crops that have won first place make a formidable list in spite of the fact that they had previous very high values to exceed. The list is corn, barley, rye, buckwheat (since the sixties), potatoes, hops, flax-seed, sugar beets (or beet sugar), and cane sugar. No other crop reached second place in order of value in comparison with other years, but the total value of all cereals and of all crops did. The crops that

reach third place are hay, cotton, and tobacco. Wheat is fourth in value, and has been exceeded in this respect in three years.

The crops of this year compare with the average of the previous five years more favorably than they do with single years when results were highest. In the list of crops that had a production above the five-year average are cotton, rice, buckwheat, beet sugar, and cane sugar.

In value of crops, the five-year average was overtopped by corn, cotton, hay, oats, barley, potatoes, buckwheat, rye, flaxseed, hops, and beet and cane sugar.

FOREIGN TRADE IN AGRICULTURAL PRODUCTS.

BALANCE IN FAVOR OF EXPORTS.

CAUSED BY THE COTTON SURPLUS.

The large surplus of value of exports of domestic agricultural products over the value of imports of agricultural products, which has been the result of this country's foreign trade for many years, seemed to be threatened by the declining surpluses of 1909 and 1910; and by the same cause the balance of trade in favor of exports of all commodities, agricultural and otherwise, was threatened with extinction unless manufactures were exported in values large enough to prevent. In the fiscal year 1908 the balance in favor of this country was \$488,000,000 in agricultural products; the next year it was \$274,000,000; in 1910 the balance fell to \$198,000,000. During the same years the balance in the trade of commodities other than agricultural in favor of exports fell from \$178,000,000 to \$77,000,000 the next year, and turned to a balance in favor of imports in 1910.

This tendency was sharply arrested in 1911, when the farmers' balance of foreign trade rose to somewhere near its former proportions. It was \$366,000,000. In the same year the balance in favor of exports in the trade of commodities other than agricultural reached \$156,000,000.

As the matter has stood for many years, the balance of trade in favor of exports, both of agricultural products and of all products, is mostly, if not entirely, due to raw cotton. That is to say, the value of the cotton exports are more or less approximate to the balance.

EXPORTS.

OVER A BILLION DOLLARS.

Three times has the total value of exports of domestic farm products been greater than a billion dollars—in 1907, 1908, and in 1911. The total for the last year—\$1,031,000,000—is exceeded only

by that of 1907, and then by only \$23,000,000. More than half of the total export value is contributed by raw cotton, the value of which is \$585,000,000.

Packing-house products gain \$21,000,000 in value over their exports in 1910, and reach the figure of \$157,000,000. But grain and grain products continue the decline which began in 1909 and have fallen to a value of \$124,000,000, a loss of \$91,000,000 in three years.

Tobacco continues to show exporting strength, and its value in 1911, \$39,000,000, is \$1,000,000 above the previous year. The same is true of fruits, with their value of \$24,000,000, or \$5,000,000 over 1910.

The exports of live animals have dwindled to \$19,000,000, which, however, is a gain of \$2,000,000 over 1910. Oil cake and oil-cake meal exports remain as the year before at \$20,000,000, but vegetable oils have risen \$3,000,000 to a value of \$20,000,000.

IMPORTS.

RECORD ALMOST BROKEN.

By falling short only \$8,000,000 the imports of agricultural products in 1911 failed to go above the highest record, in 1910. The value for 1911 is \$679,000,000.

The imported silk fiber was valued at \$75,000,000; coffee, \$91,000,000; vegetable fibers, \$56,000,000; seeds, \$30,000,000; fruits, \$27,000,000—all with increases over the values of 1910.

Declining from the previous year, the imports of wool in 1911 were valued at \$23,000,000; packing-house products, largely hides and skins, \$84,000,000; sugar and molasses, \$98,000,000.

FOREST PRODUCTS

HIGH VALUES.

The value of exports of domestic forest products continues to advance and the amount for 1911, \$103,000,000, is the highest yet reached. The exported lumber was valued at \$60,000,000; timber and logs, \$17,000,000; the naval stores, \$25,000,000.

The imports of forest products in 1911 were valued at \$164,000,000, and came within \$15,000,000 of equaling the total of 1910, which holds the highest place. India rubber was imported to the value of \$76,000,000; other gums, \$26,000,000; lumber, \$21,000,000; wood pulp, \$14,000,000, an import that has doubled in value in four years.

THE AGRICULTURAL SURPLUS.

TREND OF EXPORTS.

Coincident with the geographic expansion of agriculture on the new land of this country the exports of farm products grew in quantity. That was a period when immigrants became farmers, and farmers' sons established farms on what had been the public domain.

After a long time the new land that was fit for agriculture and could be acquired diminished, agricultural land values increased, the immigrants changed in description and were not inclined to agriculture, and the farmers' sons went to town and city. So National consumption increased in the later time in a greater degree than agricultural production did.

This is the broad, general view of the matter, although there have been many variations and readjustments in particular instances; and, in consequence of the new order of affairs, the exports of agricultural products have diminished in quantity because the National surplus has become less. They have increased in value because prices have risen.

Not all products have diminished in exports. Improved agriculture and the ability and disposition of farmers to produce for the foreign market have increased the National surplus of some products and indicate potentialities that will be beyond the requirements of National sustenance for an indefinite time.

EXAMINATION OF PRODUCTS.

A detailed examination of the export statistics of the Department of Commerce and Labor discovers what the trend has been in the quantities of the National surplus of agricultural products. Let the exports of the 10 years 1900-1909 stand for 100, and the exports of each year or group of years can be related to 100 for a simple and easily understood comparison.

The cattle exports of the 10 years 1900-1909 being 100, those of 1870-1879 were 12.4. The index number rose to 85.3 in 1890-1899 and to 102.6 in the five years 1900-1904, from which time the decline was to 34.3 in the single year 1911.

The exports of horses, mules, and sheep reached their highest figure in 1900-1904. Swine eventually met adverse legislation on the continent of Europe, and their exports declined from 236.5 in 1870-1879 to 31.7 in 1911.

Butter exports were highest in 1880-1889, for which period they are represented by 141.7, and fell to 35 in 1911. Cheese exports declined enormously from the highest figure, 494.8, in 1880-1889, to 47.8 in 1911. On the contrary, eggs have displayed a climbing tendency and have risen from 0.8 in 1870-1879 to 127 in the five years 1905-1909, and to 199.9 in 1911.

All beef and its products have been combined as far as they are ascertainable in pounds, and then it appears that the period of highest exports was the five years 1900-1904, the index number being 103. It was 43 in 1911. Canned beef was highest at 135.8 in 1890-1899 and fell to 21.9 in 1911; fresh beef dropped from 116.1 in 1900-1904

to 16.1 in 1911; oleomargarine, oleo oil, tallow, and salted and pickled beef were all highest in the five years 1905-1909.

The total for pork and its products reached the highest export mark, 102.2, in 1900-1904, and fell to 65.9 in 1911. Some pork exports were highest in 1905-1909, and these were salted and pickled pork and lard.

Lard compounds are represented by 16.8 in 1893-1899, by 68 in 1900-1904, by 132 in 1905-1909, and by 135.5 in 1911. Mutton also is able to increase its exports, and at the end of the period of 42 years under examination has the index number 164. Again, in the case of animal oils not specially named, there is a similar tendency, and the number for 1911 is 226.

In the case of cotton the exports were 35.7 in 1870-1879, and the number steadily rose to 110.9 in the five years 1905-1909. It was 85.7 in 1910 and 107.8 in 1911.

Dried apples gained steadily until 101.1 was reached in 1905-1909, and fell to 64.6 in 1911, but fresh apples have gained to the last year, for which the number is 146.7. Both prunes and raisins have an upward tendency to 1911, the former being represented by 133.8 and the latter by 367.1. Glucose and grape sugar may be added to the list of products with gaining exports.

Barley has fallen from 109.9 in 1900-1904 to 89.1 in 1911; corn and corn meal, from 117.8 in 1900-1904 to 69.3 in 1911; oats, from 123.4 to 13.4; rye and rye flour, from 139.5 to 2; wheat, from 131.8 to 28.6; wheat flour, from 118.8 to 65.5. Bread and biscuit had highest exports, 124.8 in 1880-1884, and after a decline to 96.1 in 1905-1909 rose to 111.1 in 1911.

Hay declined from 111.8 in 1900-1904 to 72.2 in 1911; cotton seed, from 120 to 37.1; clover seed, from 133.3 to 39.7; beans and pease, from 102 to 77.8.

On the contrary, corn-oil cake has advanced to 164.1 in 1905-1909 and to 275 in 1911; hops to 115.5 in 1905-1909; cottonseed oil cake and oil-cake meal to 104.4 in 1905-1909; flaxseed, oil cake, and oil-cake meal to 110.7; cottonseed oil to 108.4; linseed oil to 134.3; rice to 165.8; rice bran, meal, and polish to 106.6; flaxseed to 110.2; timothy seed to 123.1; onions to 125.2; potatoes to 124.9 in 1905-1909 and to 262.9 in 1911.

Tobacco had the index number 85.4 in 1890-1899; 101.1 in 1900-1904; 98.9 in 1905-1909; 110 in 1910; and 109.4 in 1911.

SUMMARY.

The numbers quoted in the foregoing presentation may be regarded as fairly indicating the upward or downward tendency of exports of the products mentioned.

Most of the cereals and their products, all of the animals and most of the meats and their products are going down in quantity of exports, and these three great general classes of products have filled a large place in the body of exports. Only mutton and unspecified animal oils, rice and its bran, meal, and polish, corn-oil cake, glucose and grape sugar, and perhaps bread and biscuit in these three great groups of exports display a tendency to increase.

A long record of increase is presented by cotton, hops, and tobacco. Comparatively recent products have joined the old list and give evidence of increase. Among these are cottonseed oil and flaxseed and cottonseed oil cake and oil-cake meal, linseed oil, flaxseed, and lard compounds. Among the fruits that are gaining are prunes, raisins, and fresh apples, and among the vegetables are onions and potatoes.

ECONOMIC RESULTS OF COLD STORAGE.

SPECIAL INVESTIGATION BY THE DEPARTMENT.

REASONS FOR THE UNDERTAKING.

Investigations of cold storage have heretofore been directed toward the subject from the point of view of the pure-food advocate. Legislation, actual and proposed, assumes that foods are kept in cold storage in large quantities for long periods of time, so long that the qualities of the foods deteriorate. Particular instances of storage for periods longer than a year and even two years have had prominent publicity and the inference has been drawn that such long-time storage is common. The cold-storage men were not believed when they asserted that the time of storage was usually not excessive. It has been charged against them, too, that they use cold storage for speculation and for squeezing consumers.

Because of lack of information with regard to the management of cold storage and in view of some current criticisms of the business this department made an investigation in September and October of this year.

METHOD OF PROCEDURE.

Schedules were prepared for statements of quantities of receipts of fresh beef, mutton, and pork; of dressed poultry, butter, and eggs, and of fresh and frozen fish during each month during a period of two years. The period began with March, 1909, for dressed poultry, eggs, and fish; with May, 1909, for the other commodities.

The schedules also provided for a statement of the deliveries each month out of storage to the end of August, 1911, against the receipts of each month.

Another schedule was designed for a report of the charges of storage and of the weights of packages.

The bulk of the cold-storage business is carried on in towns and cities where the Bureau of Animal Industry performs meat inspection, and at all of these places the inspectors in charge were requested to apply to the owners or managers of cold-storage warehouses, whether public or private, for the information indicated by the schedules. Warehouses outside of the area of the jurisdiction of the inspectors were approached by mail. The services of the Bureau of Animal Industry in this undertaking were performed with fidelity and with as high a degree of thoroughness as the local circumstances permitted.

The schedules that were returned were placed in charge of the Bureau of Statistics of this department for tabulation and the derivation of such results as could be extracted from them.

It appeared in the progress of the undertaking that many warehouses did not keep their records in such form as to permit the making of the statements requested, or at any rate not without a practically impossible amount of work. Many of the warehousemen made the reports after weeks of laborious efforts. With two or three exceptions, the disposition of the warehousemen was to make the reports and to give publicity to the features of their business provided for in the schedules.

It may not be generally understood that cold-storage warehousemen who do a public business rent space to the owners of commodities. The goods stored are owned by the customers and not by the warehousemen. In private warehouses, such as are owned and used by the meat packers, the commodities stored are owned by themselves.

COMPILATION OF PRICES FOR 30 YEARS.

In connection with the application to the cold-storage warehousemen for statements, several experts in the Bureau of Statistics exhausted the resources of the library of this department and of Congress, and the libraries of other departments, in collecting wholesale-price quotations of the commodities included in the investigation. The first quoted price of each month was taken as far back as October, 1880, and from that time to October, 1911. During this period of 30 years grades have changed, and also the quoted grades. Error due to this fact was avoided by taking prices for grades that remained uniform from October to October of the next year, since the series of 13 prices for each year, October to October, was to be converted to index numbers based on the mean monthly price for the year. The purpose of this compilation was to observe fluctuations before cold storage existed or was of considerable account, and to compare with fluctuations in recent years, during which this business has grown to large proportions.

IMPORTANT CONCLUSIONS WARRANTED.

Out of the great mass of details contributed by the warehousemen and obtained by the price experts and out of the profusion of the derived results extracts are made for concise and pointed conclusions. The information obtained is sufficient to alter some old views with regard to cold storage, and it also establishes new ones.

LENGTH OF TIME IN STORAGE.

PRINCIPAL MONTHS WHEN COMMODITIES ARE RECEIVED.

Warehousemen were requested not to include in their reports commodities whose owners intended to keep them in cold storage only a few days and to make no report for a warehouse doing only a temporary accommodation business. No reports, also, were to be made for fresh meats in coolers; nor was the time passed in coolers to be added to the time in cold storage proper.

The two years covered by the investigation begin with March for dressed poultry, eggs, and fish; with May for fresh beef, mutton, and pork and butter.

The principal months when fresh beef is placed in cold storage are September, October, and November; mutton, August, September, and October; butter, June, July, and August, and sometimes May; eggs, April, May, and June. Pork is quite well distributed throughout the year, and the prominence of winter in the receipts into cold storage is barely perceptible. Poultry is made up of diverse elements. Broilers go into storage from the latter part of August until November and roasters from October to December. There are besides the different varieties of poultry. November, December, and January, and sometimes October, are the heaviest storage months.

With regard to fish, there seems to be no regularity in the heavy months; the three heaviest months in the year beginning with March, 1909, were August, November, and January, but in the following year the months were April, July, and December. The kinds of fish that go into cold storage are seasonable, and the natural supply does not last throughout the year. There are also often two storages for fish. In the initial one the fish is received fresh at the place where caught and kept a length of time determined by circumstances. This place is not usually one of consumption, so that in that event the fish is transferred frozen to cold storage at a place where it is to be consumed. In this investigation the two storages are added together in stating time of storage.

During the three heavier cold-storage months of 1910-11, 47 per cent of the fresh beef placed in cold storage during the whole year was received into the warehouses; 59.8 per cent of the fresh mutton; 59.2 per cent of the dressed poultry; 70 per cent of the butter; and 79.4 per cent of the eggs.

DELIVERY WITHIN SPECIFIED NUMBER OF MONTHS.

"Delivery" is the word used in the business to indicate a taking out of storage, because the deposit is delivered back to the owner.

The New York cold-storage law of this year limits the storage of foods to 10 months, except that butter may remain for 12 months. The New Jersey law of this year fixes a limit of 10 months. The Heyburn bill assigns a limit of seven months to fresh beef, four months to veal, pork, and mutton, and three months to lamb, poultry, game, fish, eggs, and butter.

It is established by this investigation that 71.2 per cent of the fresh beef received into cold storage in the year 1909-10 was delivered within three months, 28.8 per cent of the fresh mutton, 95.2 per cent of the fresh pork, 75.7 per cent of the poultry, 40.2 per cent of the butter, 14.3 per cent of the eggs, and 35.5 per cent of the fish.

Within four months after it was received 86 per cent of the fresh beef was delivered, 42.7 per cent of the fresh mutton, 96.5 per cent of the fresh pork, 85.3 per cent of the poultry, 53.4 per cent of the butter, 22.6 per cent of the eggs, and 49.5 per cent of the fish.

The percentage of receipts delivered in seven months is 99 for fresh beef, 99.3 per cent for fresh mutton, 99.9 per cent for fresh pork, 96.1 per cent for poultry, 88.4 per cent for butter, 75.8 per cent for eggs, and 64.9 per cent for fish.

Lastly, let the percentages for the deliveries of 10 months be stated. These are represented by 99.7 per cent for fresh beef, 100 per cent for fresh mutton and pork, 98.9 per cent for poultry, 97.8 per cent for butter, 99.9 per cent for eggs, and 77.5 per cent for fish.

It is possible to parallel the above statement with one for the following year, 1910-1911, for the deliveries of three and four months, but not for a longer time. The figures for three and four months are most of them considerably below those quoted for 1909-10.

The important observation to be made is that the receipts into cold storage are entirely or very nearly exhausted by the deliveries within 10 months.

PERCENTAGE OF RECEIPTS HELD LONGER THAN A YEAR.

So common is the belief that large quantities of food are held in cold storage for more than a year that it is worth while to learn what fraction of the receipts of the warehouses embraced in this investigation has been in storage longer than $12\frac{1}{2}$ months. In March, 1909, poultry was placed in some of these warehouses; on September 1, 1911, $29\frac{1}{2}$ months afterwards, not any remained. All of the other commodities covered by this investigation had been delivered. The same fact applies to the commodities received $28\frac{1}{2}$ months before.

In one warehouse there was discovered some fresh mutton that had been in cold storage for $27\frac{1}{2}$ months, and this was 10.2 per cent of the fresh-mutton receipts of all reporting warehouses for May, 1909. Of the receipts of butter in that month, 0.3 of 1 per cent remained September 1, 1911.

So, determining the percentages in a similar manner, it was found that 0.1 of 1 per cent of the receipts of poultry for a month was still in cold storage at the end of $26\frac{1}{2}$ months and 0.3 of 1 per cent in the case of butter.

For a storage of $21\frac{1}{2}$ months, fresh mutton is represented by 0.8 of 1 per cent and poultry by 0.4 of 1 per cent. Poultry has 0.1 of 1 per cent for $19\frac{1}{2}$ months, 0.2 of 1 per cent for $18\frac{1}{2}$ months, 0.1 of 1 per cent for $17\frac{1}{2}$ months, less than 0.05 of 1 per cent for $16\frac{1}{2}$ months. For $16\frac{1}{2}$ months butter has 0.5 of 1 per cent and for $15\frac{1}{2}$ months 3.3 per cent, while mutton for the last period has 0.5 of 1 per cent.

For $14\frac{1}{2}$ months in cold storage, 0.1 of 1 per cent stands for fresh mutton, less than 0.05 of 1 per cent for poultry, 3.5 per cent for butter, and 0.1 of 1 per cent for fish.

Fresh beef had 0.1 of 1 per cent still in cold storage at the end of $13\frac{1}{2}$ months; fresh mutton, 2.2 per cent; fresh pork, less than 0.05 of 1 per cent; poultry, 1.3 per cent; butter, 6.6 per cent; and fish, 10.5 per cent.

At the end of $12\frac{1}{2}$ months fresh beef had 0.5 of 1 per cent in storage; fresh mutton, 0.6 of 1 per cent; fresh pork, less than 0.05 of 1 per cent; poultry, 0.2 of 1 per cent; butter, 6.5 per cent; and fish, 13 per cent.

This statement covers all of these commodities held in cold storage longer than $12\frac{1}{2}$ months. Warehousemen explain excessively long storages by stating that they are caused by lawsuits and other circumstances of an uncommercial nature.

AVERAGE LENGTH OF STORAGE.

Since the receipts and deliveries were reported by warehousemen for each month, it is easy to compute the average time of storage. The fresh beef received into storage during the year beginning with May, 1909, was kept there on the average for 2.3 months; the fresh mutton, 4.4 months; the fresh pork, 0.9 of 1 month; and the butter, 4.4 months. The poultry received during the year beginning with March, 1909, was kept on the average 2.4 months; the eggs, 5.9 months; and the fish, 6.7 months.

The average time of storage differs as between the first and the second half of the year adopted for the purposes of this investigation. The average time for fresh beef in the first half of the year is 2.6 months, in the second half 1.8 months; fresh mutton in the first half

4.8 months, in the second half 3 months; fresh pork in the first half 0.8 of 1 month, in the second half 1 month; poultry in the first half 2.6 months, in the second half 2.4 months; butter in the first half 4.5 months, in the second half 4 months; eggs in the first half 6.1 months, in the second half 1.7 months; fish in the first half 6.8 months, in the second half 6.7 months.

COSTS OF STORAGE.

STORAGE CHARGE, INTEREST, AND INSURANCE.

In the foregoing treatment of the information obtained with respect to the length of time commodities are held in cold storage, the subject has been examined from several viewpoints. It is apparent that long storage is exceptional.

The costs of cold storage are running against the prices of the commodities month by month. The owners must use good judgment and take their goods out of storage before the costs of storage, added to the original cost of the goods and some profit, will raise the total amount of cost above the market price. It is a problem of the future. Sometimes the owner of the goods errs in judgment and fails to make a profit, again he fails to get back the cost of goods and the costs of storage, and yet again he gets back all costs and a large rate of profit.

The warehouseman has a rate of charge for space for each commodity, in some cases for storing for the "season," and in others by the month. Another cost of storage is interest, which is not always a theoretical cost, because the owners of the commodities often borrow money on the security of their warehouse receipts, or otherwise. A third cost is insurance.

If these three costs are combined they amount to 0.437 of 1 cent per pound of fresh beef per month, or 3.5 per cent of the mean wholesale price of beef from September to November, 1910, the latest period of heavy warehouse receipts within the period covered by this investigation; for fresh mutton the costs are 0.352 of 1 cent per pound, or 3.8 per cent of the mean wholesale price in the heavy storage months, August to October, 1910; for fresh pork, 0.398 of 1 cent per pound, or 3.7 per cent of the mean wholesale price of January and February, 1911; for poultry, 0.446 of 1 cent per pound, or 2.8 per cent of the mean wholesale price of the largest class of poultry during October, 1910, to January, 1911; for butter, 0.571 of 1 cent per pound, or 2.4 per cent of the mean wholesale price of butter during June to August, 1911; and for eggs, the costs amount to 0.593 of 1 cent per dozen, or 3 per cent of the mean wholesale price of eggs, April to June, 1910.

The wholesale prices adopted for these commodities are the means of a few cities in all parts of the country.

It is evident that as the time of storage lengthens the costs and their percentage of the wholesale price must be multiplied by the number of months. If the storage is for 15 months, for instance, the cost per pound ranges from 5.273 cents for fresh mutton to 8.572 cents for butter, and is 8.898 cents per dozen for eggs; the costs for 15 months range from 36.5 per cent of the wholesale price in the case of butter to 57.5 per cent in the case of fresh mutton.

For the average length of time in cold storage, as ascertained in this investigation, the actual costs are: For fresh beef, 0.997 of 1 cent per pound; fresh mutton, 1.564 cents per pound; fresh pork, 0.350 of 1 cent per pound; for poultry, 1.079 cents per pound; for butter, 2.532 cents per pound; for eggs, 3.505 cents a dozen.

The costs of storage for the average length of time are 7.9 per cent of the wholesale price for fresh beef; 17.1 per cent for fresh mutton; 3.2 per cent for fresh pork; 6.8 per cent for poultry; 10.8 per cent for butter, and 18 per cent for eggs.

Approximately the wholesale prices of the commodities mentioned are increased by cold storage to the extent of the percentages just given.

CHANGES IN CONSUMPTION CAUSED BY COLD STORAGE.

Before the advent of cold storage there was a relative monthly consumption of commodities, such as the foods now stored, throughout the year which was adapted to the current supply, and that supply was more or less closely related in time to the production.

Cold storage has interposed to change considerably the relative monthly consumption and to make it more even throughout the year. To illustrate with a supposition, if 1 per cent of the total amount of eggs consumed in a whole year were consumed in December before the day of cold storage, perhaps 3 per cent is the figure for the present time.

There has also been a change in relative monthly prices, due to cold storage. In the case of eggs the relative price has increased in the season of natural plenty and diminished in the period of natural scarcity.

These two facts, the changes in the relative monthly consumption and prices upon passing to the cold-storage period, have been arithmetically related to each other for eggs and butter to discover the effect on the mean price for the year. It is not an undertaking that can be worked out with precision and can be only indicative.

The results are that in the cases of both butter and eggs the annual price level has been raised by cold storage, for a reason apart from the costs.

In two ways, then, cold storage has raised the cost of living.

TENDENCY TO UNIFORMITY OF PRICES THROUGHOUT THE YEAR.

THIS RESULT NOT ALWAYS INDICATED.

The prices of commodities compiled for use in this investigation begin with October, 1880, and end with October, 1911, a period of 30 years. It is the opinion of men who are well informed that at about 1893 the quantities of the commodities covered by this investigation that were placed in cold storage were large enough relative to the total supply to have perceptible influence on prices. For this reason the prices, which are the first quoted ones for each month, are reduced to a mean for the period beginning with October, 1880, and ending with October, 1893. In this period are found conditions as they existed before the advent of cold storage.

The cold-storage period is subdivided in order that the prices of the later years may be observed. The second period adopted extends from October, 1893, to October, 1902, and the third one from October, 1902, to October, 1911. The prices of each period have been reduced to a mean for each month, as in the case of the first period.

The next step is the conversion of the mean price of the first of each month for each group of years into a percentage of the mean for the year. This gives index numbers that very much facilitate an understanding of the subject.

It is evident, if the percentages, or index numbers, are 100 for all months, that there is complete uniformity of prices throughout the year. Therefore a tendency toward uniformity of prices is a tendency toward 100, whether the index number is above or below 100.

In comparing the first period with the last it appears that there was a tendency toward uniformity of prices in the case of butter in 11 out of the 13 months, or much more than half; in the case of eggs and fresh mutton in 9 months; poultry, 8 months. Less than half of the months exhibit this tendency in the cases of the other commodities—5 months for fresh pork and 3 months for beef.

If the second and third periods are compared, it appears that under the régime of cold storage there has been a tendency toward uniformity of prices for butter, eggs, and fresh mutton; away from uniformity for fresh beef and fresh pork; and no change for poultry.

Another aspect of the matter may be had by noting the range of prices for the three periods.

For butter the difference between the highest and lowest index numbers is 43.3 for the first period, 29.4 for the second, and 24.1 for the third. An approach toward uniformity is apparent, because the range between highest and lowest prices diminishes.

In the case of butter the range of prices increases from 72.3 for the first period to 74.6 for the second, but declines to 63.4 for the third.

An unbroken tendency toward uniformity appears in the case of poultry, since the range between highest and lowest prices diminishes from 28.9 for the first period to 23.5 for the second and to 15.9 for the third.

Both fresh beef and fresh pork seem to have been subject to less uniformity of prices in the third period than in the first, as indicated by increasing range between highest and lowest. The range for beef rose from 8.2 in the first period to 9.4 in the second and to 14.3 in the third.

The range for pork fell from 14.4 in the first period to 14 in the second, but rose above the first to 16.7 in the third.

The foregoing examination of range of prices substantially indorses the other process in pronouncing in favor of a tendency toward uniformity of prices with regard to butter, eggs, poultry, and fresh mutton, and of a tendency away from uniformity with regard to fresh beef and fresh pork.

SPECULATION.

EVIDENCE THAT IT SOMETIMES EXISTS.

An examination of the record of the prices of commodities prepared for this investigation gives a suspicion that there has been much speculation in some years by the men who keep them in cold storage. One illustration may be given. The egg year 1910-11 had 29 per cent more eggs in cold storage than the preceding year, and yet the price index number went much higher in the months when it is high—October to January—and much lower in the months when it is low—March to July following.

At a time when there was a plenty of eggs in storage the wholesale price of eggs soared to 43 cents in Boston in November and December and to 45½ cents in New York for near-by State eggs. There was an apparent mistake of the storage men in overestimating the consumption of the public at exorbitant prices, because so large was the unsold quantity at the beginning of the next egg year in the spring of 1911 that the wholesale price of eggs fell in April to 18½ cents in Boston and New York, and the storage men dumped so much on the foreign market as to make the greatest quantity of eggs ever exported from this country in a year.

STORED GOODS AS A PERCENTAGE OF CONSUMPTION.

LARGE ENOUGH TO BE OF PUBLIC CONCERN.

This business of storing foods has grown to such proportions that consumers have a rightful concern with its management for economic as well as sanitary reasons. From the returns made to this department by the cold-storage warehousemen, it is inferable that

the fresh beef, fresh mutton, fresh pork, poultry, butter, eggs, and fish received into cold storage in a year amounts to a weight of at least 1,000,000,000 pounds and very likely to a quarter of a billion more.

The eggs received into storage in a year are approximately $13\frac{1}{2}$ per cent of the farm production; the fresh beef is over 3 per cent of the census commercial slaughter of cattle; mutton over 4 per cent of that slaughter of sheep and lambs; fresh pork $11\frac{1}{2}$ per cent of that slaughter of hogs; and butter 25 per cent of the creamery production.

RECOMMENDATION.

PUBLICITY.

This is no indictment of the men who keep foods in cold storage, except in so far as they sometimes speculate, nor need they be indicted for offenses in order that the public economic interest in their business may be made to appear. The foregoing matter, it may be supposed, establishes that. The man who places food in cold storage is somewhat in the situation of the man who forestalls the market. He may not attempt to do so, but the power may be a temptation.

The affairs of such a business as this should have publicity. The public ought to know how much goods are in storage from month to month and what the movements of receipts and deliveries are.

The food warehousemen should be required to send to Washington monthly reports containing the desired information. Here these reports could be promptly aggregated and the results could be given to the public on a previously announced day of the month, somewhat as the crop reports are.

WORK OF THE DEPARTMENT IN 1911.

IMPROVEMENT IN BUSINESS METHODS.

On September 20, 1910, I appointed a committee on economy and efficiency to investigate business methods in the department and to report to me such changes as might seem desirable. After a very comprehensive and thorough inquiry this committee reported that in the main the business methods of the department are economical, adequate, and efficient. Some changes were recommended, which were approved by me and became effective June 21, 1911. While this inquiry was in progress, the committee cooperated to the fullest extent possible with the President's committee on economy and efficiency, and a great deal of critical, analytical, and constructive work was done, and full reports were furnished to the President's committee by the departmental committee and by the various bureaus, divisions, and offices.

CHANGES IN PERSONNEL.

The number of officers and employees on the rolls of the department July 1, 1911, as shown by the report of the Appointment Clerk, is 224 in excess of the number reported for the fiscal year 1910. The employees located in Washington number 2,514, while 10,190 are employed elsewhere. During the year 57,884 changes of every description were made, including the appointment of 33,709 fire fighters in the Forest Service, employed for brief periods, none exceeding six months. The number of persons receiving probationary appointment (equivalent to absolute appointment if the appointee is retained in the service after the probationary period) was 1,168. Ninety persons were reinstated and 60 were transferred from other departments; 694 resigned; 56 died in the service; and 42 were dismissed because of misconduct.

On July 1, 1911, there were 4,068 officers and employees on the statutory roll (comprising positions specifically appropriated for by Congress), and 8,636 were paid from lump-sum appropriations, making a total enrollment of 12,704, not including the temporary employees appointed after January 1, 1911, nor temporary field employees.

OFFICE OF THE SOLICITOR.

The fiscal year 1911 marked the period of the greatest activity in the Office of the Solicitor since its creation in 1905. During the year the administrative machinery for carrying out the several regulative acts of Congress enforced through the department has increased in efficiency. The duties of the department under these acts are becoming more sharply defined and better understood; as a result the duties and responsibilities of the Office of the Solicitor have been very largely increased. The more important of these acts of Congress are the statutes regarding the occupancy and use of the National Forests, the meat-inspection law, the food and drugs act, the 28-hour law, the live-stock quarantine act, and the Lacey Act. The normal expansion along existing lines of activity in other branches of the department has also contributed greatly to the volume of the work of this office. The legal work of the Forest Service was placed under the immediate direction of the Solicitor on January 15, 1910, and in the report for the fiscal year 1911 there is included for the first time a statement of the legal work performed by this office on behalf of the Forest Service during a full fiscal year.

WORK FOR FOREST SERVICE.

The legal work transacted on behalf of the Forest Service falls naturally into the following divisions: Opinions, contracts, claims, regulations, trespass cases, general litigation, and hydroelectric

power permits. The subject "trespass cases" resolves itself into four subdivisions: Grazing, timber, fire, and occupancy cases. During the fiscal year 1911 the Solicitor rendered 56 formal opinions, in writing, to officers of the Forest Service on the legal phases of questions arising in connection with the administration of the National Forests. Four hundred and twenty-three agreements and 196 leases were prepared, and the sufficiency of the execution of the same examined during the fiscal year 1911. More than 2,300 cases involving claims to land within the National Forests have been considered by the office during the year. Twenty-four cases as a basis for criminal prosecution and 12 actions for injunctions as a result of grazing trespasses were reported to the Attorney General. Cordial cooperation with the Interior Department has contributed to the efficient administration of the National Forests. In two cases of timber trespass, decided during the year, the Government recovered \$47,000. Railroad companies operating through the National Forests have been compelled by the courts to live up to stipulations for the protection of the forests against fire and other damage. The important case of the *United States v. Grimaud*, in which the Supreme Court of the United States had divided upon a previous argument, was again presented to the court and a unanimous decision of far-reaching effect was secured, approving the administration of the National Forests through the regulations of the Secretary, and sustaining the right of the Government to enforce such regulations by criminal prosecution. Regulations regarding the occupancy of lands in National Forests, the subjects of grazing, special uses, trespass, and timber sales were revised during the year.

MEAT-INSPECTION LAW.

One hundred and one violations of the meat-inspection amendment were reported to the Attorney General in the fiscal year 1911. Forty-three cases terminated in favor of the Government during the same period, fines or sentences of imprisonment being imposed, the fines amounting to \$3,240. In one case there was a verdict for the defendant, eight cases were dismissed, sentence was suspended in three cases, and in four instances no true bill was returned. Seventy-four cases arising under this statute were pending at the close of June 30, 1911.

FOOD AND DRUGS ACT.

The food and drugs act has been effectively enforced during the year by the department and the United States attorneys. Cordial cooperation has existed between this department and the Department of Justice. The prime object of the food and drugs act was declared in the report (No. 1780, 61st Cong., 1st sess.) of the House

Committee on Expenditures in the Department of Agriculture to be the securing of wholesome food and properly labeled drugs for the people at large. No leniency has been shown in any case based on foods alleged by the Bureau of Chemistry to contain added poisonous or deleterious ingredients which might render them injurious to health. Eight hundred and twenty-five cases were reported for criminal prosecution, and 337 seizures of adulterated and misbranded foods and drugs were recommended; making 1,162 cases or 40 per cent of the whole number of cases reported since the act went into effect on January 1, 1907. There were 683 cases prosecuted by the United States attorneys or about 50 per cent of all the cases brought to judgment up to June 30, 1911. About \$16,000 was the amount of the fines imposed, and costs were generally assessed against the defendants. Decrees of condemnation and forfeiture were entered against over 275 shipments of adulterated and misbranded foods and drugs, and it was insisted that in every case where foods were found to consist of filthy, decomposed, or putrid substances or to contain poisonous or deleterious ingredients orders be entered directing the destruction of the goods. 7

Cooperation with the department by some of the State food and drug officials has continued throughout the year, and cases based upon samples collected and examined by the collaborating officials have been reported to the Attorney General after being considered by the department when the results of the investigations have warranted such action.

Two important cases under the food and drugs act were decided by the Supreme Court during the year. The first was *Hipolite Egg Co. v. United States*. The case grew out of the seizure of 50 cans of preserved eggs under section 10 of the act in the southern district of Illinois. A decree of condemnation and forfeiture, with costs, was entered by the trial court, and the Hipolite Egg Co. appealed, asserting that the court was without jurisdiction because the eggs had not been shipped for sale within the meaning of the food and drugs act, and, further, that the court was without jurisdiction to assess the costs of the proceedings against the claimant. The decree below was affirmed, and the Supreme Court held that adulterated articles of food which have been transported in interstate commerce are subject to seizure and condemnation as long as they remain in the condition in which they were transported—that is, “in the original unbroken packages.” The jurisdiction of the district court to assess costs was also upheld.

In *United States v. Johnson* the decision was adverse to the Government. In this case misbranding was alleged of a so-called “mild combination treatment for cancer,” consisting of several packages bearing statements that the treatment would effect the cure of

cancer. The indictment alleged that these representations were false and misleading statements regarding the article and that the drug was misbranded, because analysis showed the treatment to be worthless and ineffective for the pretended purpose. On defendant's motion to quash, the district court for the western district of Missouri held that inquiry under the food and drugs act does not extend to the question whether a product is effective or worthless to accomplish the results claimed for it on the label. The judgment of the district court was affirmed by the Supreme Court. Following this decision the President sent a message to Congress urging the immediate necessity for remedial legislation.

TWENTY-EIGHT-HOUR LAW.

Under the 28-hour law 598 instances of apparent violations were reported, 350 cases were disposed of, and 30 cases were decided adversely to the United States. Penalties aggregating \$26,075 and costs amounting to \$5,783.85 were imposed. Eight hundred and seven cases were pending under this statute at the close of June 30, 1911. During the fiscal year a number of important decisions of the Federal courts were handed down in cases arising under this statute, the most important being the opinion of the Supreme Court of the United States in *Baltimore & Ohio Southwestern Railroad Co. v. United States*, in which the unit of violation under the statute was finally determined. The opinion of the Supreme Court makes the number of penalties dependent upon the number of times a carrier fails to comply with the statutory duty to unload, whether the particular group of animals not unloaded be one shipment or a trainload of stock. The tendency of courts to assess larger penalties than previously is noteworthy. In only 19 cases was a penalty over \$100 assessed in 1910—the minimum fixed in the act—while in 1911 the penalty was more than \$100 in 46 cases and the maximum fine was in 3 cases \$500, as compared with a maximum of \$400 in only 1 case in 1910.

LIVE-STOCK QUARANTINE LAWS.

The statutes for the prevention of the spread of live-stock diseases have been vigorously enforced. One hundred apparent violations of these laws were reported to the Attorney General during the fiscal year 1911. Of these 90 were apparent violations of the act of March 3, 1905, and 10 were alleged violations of the act of May 29, 1884. In all penalties amounting to \$5,580 were imposed in the 51 cases where a conviction was secured.

LACEY ACT.

During the year four cases arising under sections 242 and 243 of the Criminal Code of the United States, commonly known as the Lacey Act, were reported to the Attorney General. The case against

the 23 Japanese poachers who were arrested on Laysan Island in the act of killing birds was successfully prosecuted, the defendants being fined and imprisoned.

INSECTICIDE ACT.

The appropriation for the enforcement of the insecticide act did not become available until March, 1911. During the last four months of the fiscal year several formal and informal opinions on the construction of important sections of the statute were rendered, general guaranties filed under section 9 of the act were examined, and considerable correspondence was had with wholesalers, jobbers, and dealers.

PATENTS OBTAINED.

Nine applications for letters patent on inventions of employees of the department, for dedication to the public, were filed in 1910 and a like number in 1911. Of the pending cases 10 applications were allowed in 1911 as against 5 allowed and 1 disallowed in 1910. These inventions cover a wide range, including a plant-trimming machine, a process for wood impregnation, a camera support, a machine for testing the life of typewriter ribbons, devices for marking meats, and a method for constructing macadam roads.

OTHER WORK.

In addition to a compilation of references to the legislative history of acts of Congress enforced by the department, for use in construing any of the provisions of such statutes, and a revision of the Laws Applicable to the Department of Agriculture, embracing a compilation of existing statutes applicable to this department, the Solicitor prepared 442 notices of judgment for publication under the authority of section 4 of the food and drugs act, and prepared 20 circulars embodying decisions of the courts construing statutes intrusted to the department for execution. There is also in preparation a supplement to the annotated edition of the 28-hour law, bringing the original edition up to date.

The foregoing summary of the legal business transacted by the Office of the Solicitor scarcely conveys an adequate idea of the volume and character of the work actually performed. An examination of the reports of the various United States attorneys for the fiscal year 1911, made to the Attorney General, shows that the legal business of this department has increased in volume and importance to a very marked degree during that period. These reports, of course, make no mention of the legal business of the department which is finally disposed of by this office, not being ultimately referred to the United States attorneys.

WEATHER BUREAU.

The work of the Weather Bureau during the year has been carried on along accustomed lines. Its practical operations have consisted in the collection and dissemination of weather information and the issue of forecasts and warnings, and its remaining energies have been devoted to the study of meteorological problems yet unsolved. The routine work has been characterized by extension into new fields wherever opportunity was offered, mainly in the fruit-growing districts of the West, where spring frost warnings have been distributed under a more specialized system. The marine work has been enlarged to include meteorological charts for the Great Lakes and the Indian Ocean, which were formerly not represented in the series of ocean meteorological charts. Studies of conditions in the upper atmosphere, of solar radiation, and of the effect of climate on forests and stream flow constitute the special investigations conducted by the bureau during the year.

STUDIES OF THE UPPER ATMOSPHERE.

Kite flights at the Mount Weather Observatory and sounding-balloon campaigns at Huron, S. Dak., and Fort Omaha, Nebr., during the year completed four consecutive years of kite and balloon records. The results obtained during the year have been highly satisfactory. There were three distinct branches of this investigation: (1) Soundings of the upper air over Mount Weather, Va., by means of kites and captive balloons; (2) soundings of the air at great altitudes by means of free balloons carrying meteorological instruments; and (3) a study of temperature and pressure changes in the lower layers of the air at summit and base stations in the mountains of Colorado.

The exploration of the atmosphere by means of sounding balloons has become an international work. While a matter of general scientific interest, its importance to the Weather Bureau naturally hinges on the expectation that the facts disclosed may eventually be utilized in the improvement of weather forecasts. The discovery of conditions in the upper atmosphere altogether different from those formerly supposed to exist has been described in previous reports. The most important of these discoveries is the existence of a region in which a fall in temperature with increasing altitude ceases to take place. This stratum is encountered between 6 and 7 miles above the earth's surface and continues upward to an indefinite height. It is usually referred to as "the upper inversion." The most interesting facts regarding the upper inversion have to do with its variations in temperature and the movement of its winds.

Contrary to the order prevailing at the surface of the earth, the lowest temperatures of the upper inversion are found in equatorial

regions and the highest in the middle latitudes. Furthermore, its temperature, while practically constant from season to season, varies greatly from place to place and from day to day. European investigations seem to show that the beginning of the upper inversion is found at a lower altitude over cyclonic than over anticyclonic areas, and that it is higher in summer than in winter. Observations in this country coincide with those in Europe as to the winter and summer heights, but are inconclusive respecting the supposed relation of its altitude to areas of differing atmospheric pressure.

Sounding balloon ascensions have added much to our knowledge of the temperature of the atmosphere up to heights of 9 miles, and even higher, but the number of ascensions above that altitude is yet small. The lowest temperature recorded in any of the Weather Bureau's series of observations is -92° F. at Huron, S. Dak., in September, 1910. The vertical distribution of temperature in different sections of cyclones and anticyclones presents at times unusual features, the importance of which will be realized when it is remembered that forecasts of temperature changes are at present based entirely upon prevailing surface temperatures without taking into account the possible modifying effects that unusual temperature conditions above may introduce later.

Equally interesting are the facts regarding wind direction and velocity in the upper atmosphere. Observations show that while the lower limit of the upper inversion is not sharply defined, the air motion in the explored part of that region partakes of and is to some extent controlled by that of the lower atmosphere on which it rests. At the same time it also appears that the gyratory motion of the air characteristic of cyclones at the earth's surface and for some distance above does not extend far upward. The general conclusions as to the winds in the upper inversion in their relation to those of the lower layers are that the air currents are from some northerly direction on the east side of anticyclones and from some southerly direction on the west side, and that under practically all other conditions the drift of the air at very high levels is from west to east.

The observations taken at mountain stations in Colorado show that variations in temperature at the summit and base stations are nearly coincident in point of time and that they are generally similarly directed, but that a fall in temperature occasionally sets in on the plains while the temperature on the mountain tops is still rising. At other times the weather conditions on the mountain summits have been controlled by causes that are not operative on the plains to the eastward. These studies have increased our knowledge of the effect of local topography in the warming and cooling of the air that is trapped between the mountain ranges.

SOLAR RADIATION.

Studies in solar radiation have been continued at Washington and at Mount Weather, and were begun at Madison, Wis., during the year. Arrangements are now being made for additional pyrheliometric observations at various points in the region west of the Great Lakes and the Mississippi River. The most striking features of the record for the year were the high value of the radiation in February and March on the front of marked high barometric areas and the low value during the protracted hot wave in May.

It is believed that the determination of the intensity of direct solar radiation, of the quantity of heat received diffusely from the whole sky, and of the rate at which heat is lost at night, will not only be of value to climatologists generally, but will also be utilized by the weather forecaster. A demand has already been made by biologists for accurate data of this nature.

FORECASTS AND WARNINGS.

During the hurricane season of 1910, only two tropical storms of note visited the United States. That of September, 1910, moved from near San Juan, P. R., on the 6th to the Texas coast near the mouth of the Rio Grande on the 14th. Warnings were issued regularly until the storm disappeared. There was no loss of life nor was much damage done, except on the north coast east of San Juan. The hurricane of October was more severe, yet the damage was reduced to the minimum by timely warnings.

Plans are now under consideration for the systematic extension of the field of meteorological observation by means of cooperation between the Weather Bureau and the steamship lines equipped with wireless plying in Atlantic and southern waters, through which it is hoped to be able to locate hurricanes and other severe storms immediately following their inception.

Forecasts of the general character of the weather for a week in advance were issued weekly during the year. These, in the main, have proved reasonably accurate. The weekly forecast issued on August 21, 1910, announcing that a cool wave would pass over the country the latter part of the ensuing week, attracted special attention, and its complete verification called forth widespread and favorable comment.

These comparatively long-range forecasts are based on a study of the atmospheric conditions exhibited on the daily chart of weather observations for the Northern Hemisphere.

Special attention has been given to frost warnings in the spring, principally in the cranberry marshes of Massachusetts, in the citrus-fruit districts of Florida, and in a number of the orchard sections

of Washington, Oregon, Idaho, Utah, Colorado, and California. The plan of operations involves the closest cooperation possible between the Weather Bureau and the growers, through which the latter may be advised specifically as to the probable critical temperature and be in readiness to light smudge fires or adopt other protective measures on short notice.

By informal agreement with the Interior Department, the Weather Bureau was designated to ascertain and publish in the Monthly Weather Review the losses by floods in the United States. A summary of this character indicates that the losses during the year were about \$7,700,000, of which more than three-fourths fell upon the farmers. The value of property saved through the warnings of the Weather Bureau was estimated at \$1,047,000. The great disproportion between the losses and the value of property saved is due to the fact that three-fourths of the former were on crops that warnings could not have saved.

BUREAU OF ANIMAL INDUSTRY.

The main lines of work carried on by the Bureau of Animal Industry are as follows: (1) Inspection of animals, meat, and meat food products intended for interstate movement or for export, and of the vessels carrying export live stock; (2) inspection and quarantine of imported animals; (3) control and eradication of contagious and infectious diseases of animals; (4) scientific investigation of such diseases; (5) investigations in the breeding and feeding of live stock and poultry; (6) work relating to the dairy industry; and (7) preparation of literature and diffusion of information on these subjects.

THE MEAT INSPECTION.

The meat inspection comprises the inspection of animals before and after slaughter, the supervision of all the processes of preparing meats and meat food products, the enforcement of sanitation and correct labeling, and the exclusion of harmful preservatives and coloring matters. It is carried on at slaughtering and packing establishments engaged in interstate or export trade.

The work continues to show an increase. Inspection was conducted during the fiscal year at 936 establishments located in 255 cities and towns. There were inspected at slaughter 52,976,948 animals, consisting of 7,781,030 cattle, 2,219,908 calves, 29,916,363 hogs, 13,005,502 sheep, and 54,145 goats. There were condemned for disease or other unwholesome condition 117,383 entire carcasses and 1,009,672 parts of carcasses, making a combined total of 1,127,055 carcasses and parts that were condemned. The condemnations were as follows:

Cattle, 39,402 carcasses, 123,969 parts; calves, 7,654 carcasses, 781 parts; hogs, 59,477 carcasses, 877,528 parts; sheep, 10,789 carcasses, 7,394 parts; goats, 61 carcasses. Tuberculosis was the cause of nearly 47 per cent of the condemnations of adult cattle and over 96 per cent of the condemnations of hogs. The inspected animals furnished fully 10,000,000,000 pounds of meat. There was condemned on reinspection 21,073,577 pounds of meat and meat food products that had become sour, tainted, or otherwise unfit for food since the inspection at the time of slaughter. This amount included over 3,000,000 pounds condemned at one establishment as the result of a fire.

Inspection certificates issued for exports of meat and meat food products during the year covered 975,066,006 pounds, including all products, fresh and preserved. This was an increase of over 150,000,000 pounds compared with 1910. Inspections for the Navy during 1911 aggregated 11,112,060 pounds.

During the year 25,818 samples of various products were examined in the meat inspection laboratories for the purpose of detecting prohibited preservatives or coloring matter, adulterants, and unwholesomeness of various kinds, and passing upon the purity of condiments, water supplies, etc. The use of prohibited preservatives and coloring matters at inspected establishments appears to be exceedingly rare, and in the very few cases in which such preservatives were found their presence was evidently due to ignorance or carelessness. The most frequent violations of the regulations consisted in the use of cereal substances in sausages without proper declaration on the labels.

HORSE BREEDING.

Good progress is being made in the breeding of carriage horses in Colorado in cooperation with the State Agricultural Experiment Station. At the close of the fiscal year 1911 the stud consisted of 82 animals (34 males and 48 females). The males comprised 11 stallions two years old and upwards, 11 yearlings, and 12 weanlings, while the females included 25 aged mares, 5 four-year-olds, 3 three-year-olds, 4 two-year-olds, and 11 yearlings and weanlings. The annual culling of inferior individuals is showing its results, and the foals show better quality each year. During the year the board of survey condemned 8 animals, which were sold at auction.

The breeding of Morgan horses on the Government farm at Middlebury, Vt., continues with promising results. There were 65 head in this stud at the close of the year, namely, 17 stallions, 42 mares, and 6 geldings. Five out of a lot of 10 mares purchased last year were bred in Vermont, and are good representatives of the old-fashioned Morgan lines which have proved so valuable in mating with General Gates, the stallion at the head of the stud. The five-year-old

stallion Red Oak has been leased to the Massachusetts Agricultural College for the purpose of breeding to mares which fulfill certain prescribed conditions.

An experiment in breeding gray draft horses is in progress in Iowa, in cooperation with the Iowa Experiment Station. Four out of five foals dropped during 1911 are living. Two of these are by a Shire stallion out of Clydesdale mares, and two by a Clydesdale stallion out of Shire mares. All the mares are worked on the farm.

Although the desired appropriation for the encouragement of the breeding of horses for the United States Army was not provided by Congress, a small beginning was made in cooperation with the War Department, the slight expense on the part of the Department of Agriculture being paid from the appropriation for animal breeding and feeding experiments. Two Thoroughbred stallions were presented to the War Department by Mr. August Belmont, and these have been turned over to this department for use in accordance with a cooperative plan. The stallions are being stood for public service at the remount station of the Army at Front Royal, Va., under the direction of the Bureau of Animal Industry, and have been bred to about 50 mares. Only approved mares are bred to these stallions, and each mare owner agrees to give the Government an option on the resulting foal at three years at \$150. It is hoped that Congress will provide funds for the extension of horse breeding for the Army, as it is evident that the Government must do something to encourage the breeding of horses of the proper types if the Army of the future is to be supplied with an adequate number of suitable remounts.

SHEEP AND GOATS.

Satisfactory progress has been made in the breeding of range sheep in Wyoming. The ewes gave an 80 per cent crop of lambs last spring, and those ewes which are to continue in the experiment sheared 13.1 pounds per head.

Southdown sheep are being bred at the Morgan horse farm in Vermont, and Barbados sheep at the experiment farm of the Bureau of Animal Industry at Beltsville, Md. Native goats are being bred at the bureau farm for milk production, and in addition some representatives of the Saanen breed have recently been acquired.

CATTLE BREEDING.

The breeding of milking Shorthorn cattle in cooperation with the Minnesota Experiment Station has made satisfactory advance during the year, four herds having been added to the circuit. The operations last year were mostly confined to the general improvement of the herds. Better care and management have resulted in

improved milk and butter-fat production and in better development of the young animals.

The Holstein breeding circuit in North Dakota, in cooperation with the State Experiment Station, has been conducted on the same lines as heretofore. A year's record of all the cows was completed January 1, and the approximate cost of the production of butter fat determined. As a result several heifers have been placed in the Advanced Registry. There are now 107 pure-bred Holstein cattle owned by members of this circuit.

POULTRY AND EGG INVESTIGATIONS.

Poultry breeding for egg production and for general utility purposes is going on in Maine (in cooperation with the Maine Experiment Station) and at the bureau's experiment farm in Maryland. A plan of selection is being practiced so as to secure strains which breed true to certain definite standards of egg production.

An investigation is being conducted into the conditions surrounding the handling and marketing of eggs in the great productive sections of the Middle West, especially in Kansas, with a view to determining the causes of the heavy losses from deterioration and to preventing such losses. This work, in which State authorities are cooperating, is expected to bring about great improvement in the quality of the eggs marketed, to the advantage of both producer and consumer. Some results of this work have been published as Bulletin 141 of the Bureau of Animal Industry, "The improvement of the Farm Egg."

ANIMAL NUTRITION.

Animal nutrition investigations in cooperation with the Pennsylvania State College have been in progress for a number of years. The work is of a scientific character, much of it being done with the respiration calorimeter. The determinations of the energy values of feeding stuffs are to be continued, and it is planned to make further respiration tests.

BEEF AND PORK PRODUCTION IN THE SOUTH.

The beef-feeding experiments in cooperation with the Alabama Experiment Station are yielding results of much value to southern farmers. The work so far accomplished demonstrates that cattle can be profitably fed in Alabama in summer. Pork-feeding investigations, also in Alabama, are likewise showing profitable results. There is no doubt that the South affords a favorable field for increasing the country's meat supply, especially after the handicap of the cattle tick has been removed.

CERTIFYING PURE-BRED IMPORTED ANIMALS.

Since January 1, 1911, the Bureau of Animal Industry has undertaken the duty of certifying to the pure breeding of all animals imported for breeding purposes, the work being done by arrangement with the Treasury Department and in accordance with the tariff law. During the first six months 1,172 horses, 1,427 cattle, 12 sheep, 7 hogs, 190 dogs, and 12 cats were thus imported.

DAIRY FARMING.

Work for the development and improvement of dairying is being carried on in the South and West, and includes improved breeding, economical feeding, encouraging the building of barns, silos, etc., the stimulation of interest in dairy organizations, the improvement of city milk supplies, the operation of model dairies, the supervision of exhibits and contests at fairs, helping farmers to improve the grade of cream furnished to creameries, etc. The southern work is in progress in nine States, and the western work is being conducted in Iowa, North Dakota, Colorado, and Idaho. The reduction of the range and the increased price of land have a considerable effect on dairying in this latter region, and helpful work is being done in demonstrating new and economical methods.

Dairy farmers are encouraged to keep records showing the amount of feed consumed and milk and butter fat produced by each cow, so that unprofitable animals can be weeded out and the herd built up with good producers. The utility of keeping such records was illustrated in several instances during the year. In one herd the work resulted in the sale of 25 unprofitable cows and in another the cost of feeding was reduced from \$6.05 to \$4.63 per cow per month.

There are at present 81 cow-testing associations in the United States, comprising owners of about 40,000 cows. The department was instrumental in organizing the greater number of these, and often lends assistance when difficulties arise.

The demand for plans for the construction of dairy buildings continues heavy, and during the year blue prints were sent out for 636 buildings.

MARKET MILK INVESTIGATIONS.

The bureau has continued its work for the improvement of market milk. This consists chiefly in introducing and maintaining the score-card system of dairy inspection, in assisting at competitive exhibitions of milk and cream, and in investigating the conditions surrounding the milk supply in various places. This work is carried on largely in cooperation with city health departments, and was conducted during the fiscal year in 51 cities in 27 States. The extension

of the score-card system of inspection is producing good results. During the year 620 inspections were made in 24 States, these inspections always being made in company with the local health officer or one of his assistants. Nine competitive milk and cream contests were participated in by the bureau. The milk supply of several of the Government departments is being supervised, and a special investigation of the milk supply in the vicinity of Boston, Mass., has been under way for several months.

DAIRY MANUFACTURES.

Assistance has been rendered to creameries as heretofore by furnishing information and advice regarding creamery operations. Periodical reports are received from about 1,300 creameries in various parts of the country, and these enable the bureau to point out defects in operation, so that losses may be overcome, the quality of the product improved, by-products utilized economically, and waste avoided. Field men are located in Wisconsin, Minnesota, Iowa, California, and Texas, and personal attention is given to such cases as seem to require it. During the year 74 creameries were visited by these men.

The market inspection of butter indicates that a large quantity of low-grade butter is still being manufactured. Of 2,161 shipments inspected from creameries in Minnesota, Wisconsin, and Iowa, only 277, or 13 per cent, graded "extra." The department endeavors to point out how improvement can be effected.

The department also aids in the organization of new creameries by furnishing articles of agreement, lists of machinery, etc., but care is exercised to give this assistance only in those localities where creameries are likely to succeed.

An investigation into the most practicable method of harvesting and storing natural ice was undertaken because a large number of dairymen who might avail themselves of such ice at little cost at present do not use any at all. The lack of ice is responsible for a large amount of bad cream received at creameries, as well as for much of the inferior milk delivered in cities.

The manufacture of renovated butter was supervised during the year, in accordance with law, at 38 factories in 13 States. The total quantity produced was 41,115,058 pounds, of which 118,990 pounds was exported.

DAIRY RESEARCH LABORATORIES.

The dairy research laboratories were engaged during the year upon various technical problems connected with milk, butter, and cheese. Work on milk and butter is carried on at the central laboratory in Washington and the field laboratory at Troy, Pa. Chemi-

cal and bacteriological work on the Swiss type of cheese is done at Washington, the cheese being made at the Pennsylvania State College in cooperation with that institution. Experiments in the manufacture of the Cheddar type of cheese are carried on at Madison, Wis., in cooperation with the Agricultural Experiment Station of the University of Wisconsin. Work on the Roquefort type of cheese is conducted at Storrs, Conn., in cooperation with the Storrs Agricultural Experiment Station. Investigations on milk secretion are carried on at Columbia, Mo., in cooperation with the experiment station of the University of Missouri.

The work with milk during the year consisted mostly of a study of the bacteria of pasteurized and raw milk. In addition about 150 analyses of goat's milk were made, and the use of buttermilk and whey as by-products received attention.

Investigations were carried on pertaining to changes in storage butter, and experiments were made with a view to producing dried cultures for use in butter and cheese making. The results of the Roquefort cheese investigations for assisting the manufacture in this country of that well-known European variety of soft cheese will soon be ready for publication.

Some important results have been secured in the milk-secretion experiments, wherein certain cows were fed rations varying from below maintenance to fattening. These results will be published in due course. Work has also been done concerning the effect on the milk when cows are fed with cottonseed products.

THE STUDY AND CONTROL OF ANIMAL DISEASES.

Some of the animal diseases which have been the subject of investigation and eradication during the fiscal year are Texas fever, tuberculosis, glanders, hog cholera, rabies, dourine of horses, scabies in sheep, cattle, and horses, lip-and-leg ulceration of sheep, ringworm of sheep, roundworms and tapeworms of sheep, gid in sheep, necrobacillosis of various animals, chronic bacterial dysentery of cattle, swamp fever of horses, and poultry diseases. A few facts concerning the more important of these will be mentioned.

TEXAS FEVER AND TICK ERADICATION.

The eradication of the ticks which transmit the contagion of Texas fever of cattle and which inhabit the southern part of the country is proceeding vigorously in cooperation with State and local authorities. During the fiscal year the territory released from quarantine as a result of this work aggregated 10,965 square miles. Since the beginning of systematic work in exterminating these ticks five years ago there have been cleared of ticks and released from quarantine

139,821 square miles. This is about one-fifth of the original infested area.

Dipping experiments have been continued with a view to finding the most effective and economical means of ridding cattle and pastures of the ticks. Recent work shows that arsenic yields better results than the crude petroleum formerly used as a dip. Arsenical dips are therefore now being principally used.

During the year 4,016,048 inspections of southern cattle were made by employees of the Bureau of Animal Industry in connection with the work of tick eradication. The number of cattle permitted unrestricted movement under certificate was 103,338, and of these 45,613 were dipped or otherwise treated.

The movement of cattle from the quarantined area is carefully regulated so that the disease can not be transmitted to animals outside the area. There were shipped from the quarantined area to northern markets during the quarantine season of 1910, under the supervision and in accordance with the regulations of the department, 1,065,119 cattle.

SCABIES OF SHEEP AND CATTLE.

In the work for the eradication of the parasitic diseases known as scabies in sheep and cattle, employees of the Bureau of Animal Industry made 56,584,129 inspections of sheep and 18,593,251 inspections of cattle, and supervised 12,715,631 dippings of sheep and 1,234,123 dippings of cattle. There were released from the quarantine for scabies of sheep 22,560 square miles in Oregon, and from the quarantine for scabies of cattle 14,810 square miles in South Dakota, Nebraska, and Kansas.

TUBERCULOSIS.

Tuberculosis has been for many years a subject of investigation by the Bureau of Animal Industry. During the year the problem of protecting animals from the disease by vaccination has been studied at the Bureau Experiment Station. Some favorable results have been obtained, but, as the only methods found effective require the use of living tubercle bacilli, such methods are not considered practicable for general use because of the danger of spreading the disease.

Some important results were obtained during the year in the pathological laboratory through a study of material from hogs fed upon garbage from the kitchen of an institution where tuberculous insane were kept. Both the human and bovine types of tubercle bacilli were obtained from these hogs. Further tests were also made in the laboratory with the ophthalmic and intradermal methods of applying the tuberculin test for the diagnosis of the disease.

The work of eradicating bovine tuberculosis in the District of Columbia as reported last year has been followed by the systematic

retesting of cattle with tuberculin to guard against the reappearance or reintroduction of the disease. The testing of dairy herds in Maryland and Virginia which supply milk to the city of Washington has also been continued. During the fiscal year the tuberculin test was applied to 4,327 cattle in Virginia, 1,847 in Maryland, and 1,967 in the District of Columbia. The percentage of diseased cattle among those not previously tested was 16.06, while in the retests it was only 3.95. Seventy-three reacting animals in the District of Columbia were slaughtered, and in all but one case the lesions of tuberculosis were found on post-mortem examination, thus verifying the result of the tuberculin test.

INSPECTION OF LIVE STOCK FOR INTERSTATE MOVEMENT.

In addition to work already reported, the bureau inspects live stock for interstate movement for purposes other than immediate slaughter, and tests cattle with tuberculin and horses and mules with mallein, when such measures are required by the laws of the State or Territory to which the animals are destined. In this work 52,230 cattle were inspected during the year, of which 18,778 were tested with tuberculin. Similarly 34,789 horses and mules were inspected and 5,789 tested with mallein.

DOURINE OF HORSES.

An outbreak of a disease of horses in Iowa, suspected of being dourine, was reported in May, and a prompt investigation was made, as a result of which the scientists of the Bureau of Animal Industry were able by prolonged search with the microscope to find in the blood the causative organism of the disease. This was the first time that the organism had been demonstrated in a natural infection in the United States, although the disease had existed in this country for some years and had been stamped out about five years ago. The manner in which the present outbreak was introduced was not positively determined, although indications pointed strongly to its having been brought in by an imported stallion. Strict quarantine measures were at once enforced, with the cooperation of the Iowa State authorities, and the disease is now believed to be practically eradicated.

HOG CHOLERA.

The practical value of the serum for the prevention of hog cholera, produced after long experimentation by the Bureau of Animal Industry, is now generally recognized. At the suggestion of the department, the large hog-raising States have taken up the manufacture and distribution of the serum, and upward of 200,000 inocula-

tions have already been made by State officials in 21 different States. The results of this work have been extremely favorable.

At the request of Nebraska State officials and the Nebraska Swine Breeders' Association the bureau carried out a demonstration with the preventive serum at South Omaha during the year, similar to a previous test held at Kansas City. Thirty young hogs were used, of which 4 were inoculated with blood from hogs sick of hog cholera, 18 were given one dose of the serum, and the remaining 8 were left untreated. All the hogs were then placed together in one pen, the experiment extending from July 23 to September 17. The result was that the 4 inoculated hogs as well as the 8 untreated hogs died of hog cholera, while the 18 hogs that had been given the serum all remained perfectly well.

RABIES.

During the fiscal year the brain tissues from 173 suspected cases of rabies were examined in the pathological laboratory at Washington, including 152 dogs, 8 cattle, 2 hogs, 1 horse, and 1 goat. The great majority of these cases came from the District of Columbia and the surrounding country. One hundred and thirty proved to be positive, the method of diagnosis being the detection of Negri bodies, supplemented in some instances by the inoculation of rabbits.

EXPORT AND IMPORT ANIMALS.

During the fiscal year there were made 370,369 inspections of American and 32,470 inspections of Canadian animals for export. The number of animals actually exported was 171,006; the greater number of inspections is accounted for by the fact that many of the animals were inspected two or more times. This work also includes the supervision of vessels, of which 438 inspections were made.

All live stock for export to Canada are inspected by bureau veterinarians, and cattle, horses, and mules must in addition be tested—the cattle with tuberculin and the horses and mules with mallein. During the year 13,404 horses, 1,046 mules, and 460 cattle were thus tested, the reactions numbering 251 horses, 12 mules, and 16 cattle. The other inspections for Canada were 28,428 sheep, 25 goats, and 110 swine.

A strict inspection, with quarantine in certain cases, is maintained over all animals imported from foreign countries. This is necessary in order to exclude the numerous animal diseases which are prevalent in other parts of the world. For this purpose hay, hides, wool, etc., are also inspected and disinfection required. The total number of import animals inspected during the year was 261,478, and of these 4,127 were quarantined in accordance with the regulations.

DISTRIBUTION OF VACCINE, ETC.

Over 1,000,000 doses of blackleg vaccine were prepared and sent out during the year by the Bureau of Animal Industry. The necessity for immunization against this virulent disease of young cattle is being more thoroughly appreciated by cattle raisers, and the department vaccine is the means of preventing heavy losses.

Tuberculin and mallein are furnished to State, county, and municipal officials for the diagnosis of tuberculosis and glanders, respectively. During the past year 422,043 doses of tuberculin and 91,642 doses of mallein were sent out.

The department does not distribute the preventive serum for hog cholera, this work having been taken up by State laboratories, as already mentioned.

NEEDED LEGISLATION RELATING TO ANIMAL INDUSTRY.

Further legislation by Congress is urgently needed in order to enable the department to deal more effectively with matters relating to the live-stock industry.

It is especially desirable that the Secretary of Agriculture should have power to control and supervise the manufacture and importation of vaccines, serums, and like substances used for treatment of animals, so as to insure their purity and potency. Such preparations, when contaminated, have in the past been responsible for the introduction of contagious diseases into the country. The great cost of eradicating these outbreaks should alone be a sufficient reason for granting the authority required.

Further legislation is also needed for the regulation of live stock in interstate transportation, so as to prevent more effectively the spread of contagious disease and to secure more humane treatment of the animals in transit.

These matters are discussed more fully and specifically in my report for 1910 and in the report of the Chief of the Bureau of Animal Industry for the fiscal year 1911.

BUREAU OF PLANT INDUSTRY.

There are over 6,300,000 farms in the United States, and the demand for help from these farms is growing greater each year. The Bureau of Plant Industry is endeavoring to meet some of these demands, and its activities now extend into many fields, covering research, experiments, and demonstrations. The primary function of the bureau is to develop and encourage constructive agriculture by assisting the farmer to increase the output per acre and at the same time to build up and maintain the fertility of the land. The

manner in which this is being done and some of the more important results accomplished during the year are set forth under the following heads:

FOREST PATHOLOGY.

The continued spread of the chestnut-bark disease, particularly southward and westward, has caused great public alarm. The method of destroying advance infections devised by this department and described in previous publications has been energetically applied in Pennsylvania, and recently also in New York. There is every reason to believe that the disease in these two States can be limited to the eastern counties. The State appropriation for this work in Pennsylvania is \$275,000. In the New England States it will probably still be possible to keep the disease to the west of the Connecticut River; but this is essentially a local issue, with little bearing on the welfare of other States. What is done in western Maryland, in Virginia, and in West Virginia, however, is a matter of national importance, for the fate of the chestnut in the southern Appalachians, where the finest and most extensive stands of chestnut timber occur, depends upon the checking of the bark disease in these States during the next three years. This department can cooperate to any extent in the study of all phases of the disease and in the location of advance infections, but the actual destruction of diseased trees must, for legal reasons, be exclusively a State function. It is therefore to be hoped that these critical States will be able promptly to follow the vigorous example of Pennsylvania. No other tree disease of equal seriousness is known to science, and unless prompt, united, and effective action can be taken there is every reason to believe that the chestnut tree will be practically extinct in certain sections of North America within 10 years.

On account of their important relation to reforestation, damping-off and other diseases of forest-tree seedlings have received special attention. The results of the past season's work have confirmed the previous report of absolute success in controlling the serious "blight" of coniferous seedlings by slight and perfectly practicable changes in the management of water supply and shade. For two seasons past the use of sulphuric acid in preventing the damping-off of coniferous seedlings in the Forest Service nursery at Halsey, Nebr., has been successful. If these results are confirmed by work in other localities and other years, damping-off, so far as coniferous seedlings are concerned, will cease to be an uncontrollable factor in reforestation. The use of sulphuric acid as a soil fungicide originated in this department, as reported in previous publications.

It is unfortunate that at this time, when interest in reforestation is at its height, we should knowingly import a destructive European

nursery disease. Yet this appears to be the case. The white-pine blister rust, referred to in previous reports, is unquestionably still being imported. All importations that could be located have been inspected and all visibly diseased trees destroyed, but there are no means of locating all importations. The importation of white-pine seedlings should be flatly prohibited, as the damage which this disease can do, and probably will do, if once established in America, is out of all proportion to the value of all white-pine seedlings ever imported or ever likely to be.

Data collected in the forest-disease survey have indicated that in America timber decay and tree disease are second only to forest fires as causes of loss. In theory it is easy to remove diseased trees in the forest when cuttings are made, leaving only healthy individuals for seed trees, and so continually improve the health of the forest; but in practice so many questions of economy and differing local conditions are involved that many difficulties must be overcome. The Bureau of Plant Industry has given a great deal of attention to working out this problem, in active cooperation with the Forest Service. To this end, pathologists have been stationed in four of the six National Forest Districts. In District 5 great progress has been made in so conducting timber sales that all dangerously diseased trees are removed and only healthy and desirable individuals are left to propagate the future forest. Probably the most important function of these "district pathologists" is to look out for dangerous new diseases. There is every reason to believe that if the chestnut-bark disease, for example, had started in a National Forest District having a pathologist it would have been eradicated as a matter of routine before infection became general. Great epidemics of this kind are as serious in their effects as forest fires, and there is no reason why as strenuous efforts should not be made to control them.

CROWN-GALL AND OTHER PLANT DISEASES.

An important line of work carried on during the past year has been a continuation of the study of crown-gall of plants, with special reference to its relation to malignant animal tumors. The new facts we have learned are, in brief: (1) That bacteria occur also in the secondary tumors; (2) that in most cases the secondary tumors are connected with the primary tumor by a deep-seated strand of tumor tissue, from which the original bacterium has been cultivated out; (3) that the cell structure of the secondary tumor is like that of the primary tumor, *e. g.*, when the primary tumor occurs on the stem and secondary tumors subsequently appear in the leaves the structure of the leaf tumors is that of the stem. A bulletin is in preparation which will fully illustrate these new features.

The work in the bud-rot of the coconut palm has been completed, the very interesting discovery having been made that the organism associated with typhoid fever and not hitherto known to be a plant parasite is the cause of the bud-rot disease. A bulletin on the subject is now in press.

DISEASES OF FRUITS.

A feature of the fruit-disease problems of the year has been the prevalence of physiological diseases, particularly of the apple. In the Eastern States physiological troubles have occurred in the form of corky spots in the flesh of apples, accompanied by more or less distortion in the shape of the fruit. The York Imperial, the Ben Davis, and other commercial varieties have been affected so seriously as to injure the sale of fruit from orchards. These troubles are attributed mainly to the abnormal climatic conditions of the 1911 season.

A group of diseases, such as rosette and chlorosis, has developed in eastern orchards so as to attract attention, and they have increased greatly in the Western States. The extreme climatic conditions of the season have resulted in more injury by the new combination sprays of lime-sulphur and lead arsenate, but nevertheless these sprays are proving to be the most universally satisfactory remedies that have ever been devised.

Very satisfactory results have come from the researches on apple mildew and its treatment. Experiments on this disease in the Watsonville district of California, in cooperation with the local authorities, have developed a satisfactory method of control by spraying.

The cedar rust, or orange rust, of the apple, which was so common in the Appalachian fruit belt last season, was very much less abundant during 1911. Most of this was the result of climatic conditions, though the application of control measures, such as cutting down the cedars and spraying, helped to reduce the disease.

Spraying experiments on the pecan scab were continued for the third season, and Bordeaux mixture was demonstrated to be a specific for pecan scab in Georgia. The pecan rust on nursery stock was studied and complete success obtained in controlling it by spraying.

Peach spraying work for the control of peach scab and brown rot was conducted in West Virginia, Delaware, and Michigan. A portion of the work was experimental, for the purpose of testing new fungicides and perfecting the self-boiled lime-sulphur treatment, but most of the work was in the nature of demonstrations. The results were very striking, and showed conclusively that where one or both of these diseases are prevalent the net profits from a peach crop may be doubled, or in some cases quadrupled, by spraying at the proper time.

Apple spraying experiments and demonstrations were conducted in several widely separated districts, and it was again shown that lime-sulphur properly diluted is a more satisfactory fungicide for certain apple diseases than Bordeaux mixture. However, owing to the severe weather conditions of the season, the combination of lime-sulphur and arsenate of lead caused considerable burning of the fruit in a few orchards, but this trouble was not so serious as to discourage the use of this spray.

The grape anthracnose is very destructive to both fruit and vine. Certain varieties in some localities are attacked every year by this disease. The department has demonstrated the past season that this malady can be satisfactorily controlled by proper spraying of the vines while in a dormant condition. Further confirmation of previous results in the control of black-rot of the grape has also been obtained. Very promising results have been secured in controlling the anthracnose of the cranberry, which has been found to be a prevalent cause of loss in some cranberry districts. Considerable progress has also been made in the study and control of other small-fruit diseases.

DISEASES OF COTTON AND TRUCK CROPS.

Diseases of the potato have assumed unusual prominence throughout the country during the past season. Physiological disturbances have combined with several parasitic diseases in bringing about a general reduction of the crop. Blackleg and both the early and late blights have been sufficiently severe to emphasize the importance of a more general adoption of preventive treatment by growers, but by far the most serious damage has been caused by potato wilt, a disease which usually assumes an inconspicuous form, causing premature ripening followed by dry-rot in storage. The unusually dry season, which retarded the early growth of the plants, was very favorable for the development of wilt. The resulting epidemic has served to emphasize the wide distribution of this disease and has given it a new importance. Studies are under way which should lead to a more thorough knowledge of the causes and the means of control.

Investigations on the diseases of sweet potatoes have been inaugurated and substantial progress made. The causes of the more important troubles are now known, some of them for the first time, and means of control are being studied with encouraging results.

The disease-resistant varieties of cotton, cowpea, and watermelon which the department has developed are being brought into more general trial by thoroughly organized cooperative arrangements with growers in the infested sections. This organization is being extended as rapidly as the nature of the problem and the facilities of the department will permit.

Cooperative demonstration work on the control of truck-crop diseases by proper spraying methods is a new form of work inaugurated to bring the latest results along these lines to the attention of growers. An important feature of this work is the development of special machinery and technique to meet the demands of the varying conditions of culture and climate in different sections.

PATHOLOGICAL INSPECTION WORK.

The necessity of pathological inspection of all foreign importations has long been recognized, and in the early years the mycologist was called upon at irregular intervals, i. e., whenever importations were received by the department, to make examinations. As the Office of Foreign Seed and Plant Introduction developed and extended its geographical range, inspection of the department's plant imports has been definitely systematized by means of regular examinations, and printed health certificates or written reports for treatment or quarantine are furnished as occasion requires. The same methods are followed in connection with the congressional seed distribution, crop physiology and breeding investigations, and the Office of Gardens and Grounds. Card indexes are maintained for a complete file of observations and results. Advance information is furnished agricultural explorers, that they may be aware of diseases indigenous to certain countries or geographically restricted, thus enabling them to avoid unnecessary expense in making collections which would have to be condemned at Washington.

NEED FOR TRAINED PLANT PATHOLOGISTS.

The growing need for trained plant pathologists to take up numerous problems which are now being presented to this department for solution is extremely urgent. While the universities and colleges appear to be doing what they can, it happens usually in our work that men fresh from college do not have the requisite outlook or the necessary training to obtain practical results in this field. Usually we have to give them several years of additional training in order to make them most serviceable to the advancement of agriculture in these lines. Every year requests come to us from the experiment stations and similar institutions in the United States to name persons well qualified for appointment to positions involving plant pathological research in these various institutions, and, unfortunately, in a very considerable number of cases we have to say that, glad as we would be to recommend persons, there are none in sight with the necessary training. This lack of a sufficient number of trained pathologists works to the serious disadvantage of agriculture in this country. The department would be glad to have in training an additional number of young men for such positions.

COTTON IMPROVEMENT ON A COMMUNITY BASIS.

To secure the full advantage from improved varieties of cotton it is essential that each locality growing the improved variety produce a sufficient quantity to warrant its reaching the manufacturers unmixed with other varieties. In a community that planted only one kind of cotton, the crossing of varieties in adjacent fields and the mixing of seed in gins would be avoided, selection could be made much more effective, and the production of a larger quantity of uniform fiber would secure higher prices. In view of these and other obvious advantages, special attention has been given to establishing improved varieties and methods of selection in communities organized for the production of a single type of cotton.

LONG-STAPLE COTTON IN THE ATLANTIC STATES.

The advance of the boll weevil has reduced the production of long-staple Upland cotton in Mississippi and Louisiana, resulting in an acute commercial demand for this type of fiber. The action of State quarantine laws against the importation of cotton from sections infested with the cotton boll weevil and the high prices realized by eastern growers of the Columbia variety originated by this department have stimulated interest in this variety to the extent that all the available supplies of good seed were long ago exhausted. Special efforts are being made to preserve the uniformity of this variety by growing new supplies of seed under conditions of isolation from other cotton and by more effective cooperation in the work of selection.

SUGAR-BEET INVESTIGATIONS.

The sugar beet has established itself as one of the most important agricultural crops over a large section of the country, but in the transplanting of this European industry to the virgin soil of America many new problems have arisen. A system of well-equipped field laboratories in the beet-growing regions, where studies in pathology, breeding, and agronomy can be carried out in close contact with the fields, is essential to a speedy and successful solution of the various problems presented. Two such additional laboratories have been established during the past year, and others are contemplated for the near future.

Leaf-spot and curly-top, two important diseases of sugar beets, have received special attention, and work upon damping-off and root-rot has been inaugurated.

The breeding of special strains of beets for American conditions is an important line of work which should yield valuable results. It

has already been shown that American-grown seed yields beets which are superior to those grown from European seed. Moreover, the seed produced by Europe is insufficient to meet the increased demands of both the European and the American markets. Indeed, Old World dealers have recently turned to America in an attempt to purchase large quantities of American-grown sugar-beet seed for sale in Europe. It appears that America must produce her own beet seed before the beet-sugar industry can become properly established here. It is only natural that in the face of the present shortage the best of the European seed should be retained for use there, so that the American sugar-beet growers are not only sending many hundreds of thousands of dollars annually to Europe for seed which should be produced at home, but they run grave risks of securing only inferior seed which will materially reduce the profits of beet growing.

A number of problems in beet culture and questions of irrigation and rotation are also pressing for solution. Work along these lines has been inaugurated and is being pushed with all possible dispatch. In order to profit as fully as possible by the knowledge gained by Europeans in their long experience with this crop, a representative of the department has been sent to visit the beet fields and experiment stations of Germany, France, and Russia, with a view to the adapting of their practices to American conditions.

SOIL-BACTERIOLOGY AND WATER-PURIFICATION INVESTIGATIONS.

The results reported by cooperators using cultures of the nodule-forming bacteria for inoculating legumes indicate the continuation of a high percentage of successful inoculation. The description of convenient methods for distinguishing between the infection of crown-gall upon the roots of legumes and the development of the nitrogen-fixing nodules offers some opportunity for controlling the dissemination of crown-gall when the inoculation of legumes is attempted by the use of soil from old fields.

In the investigations in general soil bacteriology the study of cellulose destruction has for the present become of the greatest importance. Many new species of cellulose-dissolving bacteria and other fungi have been isolated, and it is believed that these are closely correlated with the development of nitrifying and nitrogen-fixing bacteria and therefore with the maintenance of soil fertility.

Through correspondence, various improvements have been suggested in water supplies and especially in the case of pollutions from odor-producing algæ. The most desirable treatment for the eradication of these organisms has been determined by the examination of samples shipped to the laboratory from the polluted supplies.

WORK ON DRUG PLANTS.

During the year the camphor work has progressed as rapidly as the nature of the problem would permit. Since the trees must make a growth of several years before the product can be utilized, the present task has consisted chiefly in growing trees for planting the experimental area and in setting out the stock already developed. Owing to the severe frost of the winter striking the newly transplanted stock at a critical time, considerable losses were experienced. This rather unusual result has led to a change in the handling of the young stock which it is believed will largely decrease the danger from this source. Laboratory and factory work has been continued with marked improvement in the experimental products.

The hop work has been directed toward the same objects as heretofore, and the results of statistical study of representative hop areas have corroborated the correctness of conclusions previously drawn. It seems clear that under current practice too few vines are trained to secure the maximum yield. Experimental work on different methods of pruning and fertilizing promises to develop important results also. The breeding work has gone far enough to show that among the large number of hybrid seedlings grown a number of new types have appeared which give great promise. A laboratory study of certain important hop constituents has shown that varietal or geographical characteristics can be detected which should simplify somewhat the problem of judging hop values. Further work along this line must be fruitful of most valuable results.

POISONOUS-PLANT STUDIES.

The field work of the year has covered two chief lines of activity: (1) Feeding work carried on with suspected plants at the field camp near Baldwin, Colo., and (2) visits to the national forests in which considerable losses due to poisonous plants were suspected. Feeding work has been continued with the species of *Delphinium* (larkspur) available in the vicinity of the feeding station, with species of *Lupinus* (wild lupine), species of *Cicuta* (water hemlock), and others. Several serious sources of trouble were demonstrated and means of greatly reducing the losses were worked out for the larkspurs. It is hoped this result may be of much value to the stock interests, since losses due to larkspur poisoning are very great and are experienced on practically all the cattle ranges in the western mountains.

Reconnaissance work on several of the national forests reporting the severest losses has been done, and in cases of plant poisoning it has usually been possible to indicate the source of trouble and often to suggest helpful measures.

On account of the urgency of the demand from stock regions of the West, this work up to the present time has been largely confined to that section of the country, but it is hoped to investigate in the early future a number of similar problems occurring in the East.

Laboratory work on the nature of the active principles present in poisonous plants and poisonous-plant products has been carried on chiefly at Washington.

The question of spoiled corn and its relation to pellagra has been under investigation, the agricultural side of the problem only being considered. Toxic substances have been isolated from cultures of organisms occurring on spoiled corn and some new constituents have been isolated.

PLANT PHYSIOLOGICAL INVESTIGATIONS.

During the year the problem of the storage of sweet potatoes has been actively investigated. The difficulty of keeping sweet potatoes has suggested a study of the physiological behavior of this product under different storage conditions in the hope of finding the cause of the weakness and of working out a convenient method of handling them for long-time storage.

A physiological study of certain pathological conditions arising in cabbage and spinach in prominent eastern trucking regions has been undertaken. The investigation has shown derangement in certain enzyme relations, and a method for accurately investigating these has been worked out. The curly-top of sugar beets has also been under study.

The physiological requirements of plants have been much investigated in the past, but certain new considerations have come to attention during late years, which have seemed to demand investigation of certain of these problems viewed from the new standpoints. Such a study has been undertaken with very suggestive results.

The chemical variability of certain important drug plants has been under investigation in the hope that uniform active products might be developed. A good basis for further work has been obtained, and the outlook for success seems good.

ALKALI AND DROUGHT-RESISTANT PLANT-BREEDING INVESTIGATIONS.

Investigations during the year have been in large measure directed toward ascertaining why some varieties of crop plants endure drought better than others, since it is evident that the best results in variety testing and breeding for drought resistance can only be attained when this problem is solved. It is practically certain that "root pull" is not an important factor, for extensive experiments have led to the conclusion that there is very little difference in the

ability of the roots of plants from arid regions, as compared with those from humid regions, to extract water from a nearly dry soil. Economical use of the moisture available, as evidenced by the production of a maximum crop with a minimum loss of water in transpiration, is believed to afford the best criterion of superior drought resistance. An immediately applicable result of these physiological investigations is the working out of a method for testing in the field the comparative drought resistance of different species and varieties, which it is believed can be successfully used, even in wet years, thus greatly accelerating the progress of variety-testing and plant-breeding work.

As regards the indicator value of natural vegetation, the results of preliminary studies in the Intermountain or Great Basin region support the conclusion previously reached in the Great Plains area that the native growth is the safest guide to follow in selecting new land for agricultural purposes. Certain types of vegetation are found to characterize land that is suitable for "dry farming." Other types are a pretty certain indication that the water relations of the soil are unfavorable or that there is a dangerous quantity of alkali salts, even though the appearance of the surface soil may not indicate the presence of alkali.

Several bales of lint of the new Yuma variety of acclimatized Egyptian cotton grown in Arizona in 1909 and 1910 were purchased by one of the largest American firms which use this type of cotton at a considerable premium above the price obtaining at Boston on the date of sale for high-grade imported Egyptian cotton. The results obtained in spinning this cotton were highly satisfactory to the purchaser. This additional assurance of the good quality of the fiber, together with the satisfactory yields obtained at several different localities in the Southwest, justifies the conclusion that this Yuma variety is well adapted to the commercial production of cotton of the Egyptian type.

DATE CULTURE.

As the date trees of imported varieties now on trial gain in maturity, their true characteristics and adaptation to particular conditions become more apparent. The present year's results at Mecca and Indio have brought into prominence a few varieties favorably noticed for several years, but now definitely to be recommended for trial on a commercial scale.

With the fruiting of young trees grown from seed distributed to department collaborators a number of new varieties of decided merit are appearing, and certain imported sorts are showing an unusual proportion of meritorious seedlings. We now have also for the first time the opportunity of using pollen from male trees of known

parentage, and date breeding along definite lines began with last spring's pollinations. Artificial ripening by a very inexpensive method has been carried to a perfection not heretofore attained, and the limited output of the Deglet Noor variety so handled commanded fancy prices.

The results secured by the department in date culture have stimulated considerable activity in date planting and the development of the industry bids fair to advance about as rapidly as the slow propagation by offshoots will permit.

CONDITIONS AFFECTING CROPS IN ARID REGIONS.

Serious misconceptions have developed regarding the possibilities of crop production in semiarid regions, owing to the lack of definite information regarding the prevailing conditions in such regions. The large yield reported from time to time in the daily press is that of the exceptional crop grown as the result of an unusually heavy rainfall or under such peculiar local conditions that it receives more than the normal water supply of the region. For this reason the department is making measurements at each of its semiarid experimental farms to determine as nearly as possible the exact conditions of temperature, rainfall, and evaporation under which each crop is produced. In addition, systematic measurements are made of the moisture content of the soil under different methods of cultivation and crop rotation, to determine what methods are most efficient in getting the rainfall into the soil and making it available for the growing crop. In this way we are able to determine the conditions under which each crop is produced and the effect of those conditions upon the yield. These measurements will be continued until sufficient information is obtained regarding conditions in each section where dry farming is being attempted. A preliminary report covering the results of the first four years' observations is now in preparation.

TOBACCO INVESTIGATIONS.

Experiments and demonstrations in improved methods of tobacco production have been carried out at local field stations in most of the leading tobacco-growing sections, and laboratory studies on the relation of the composition to the quality of the leaf have been continued.

The method which has been devised for applying artificial heat in curing cigar tobaccos has been used successfully during the past season by several growers in the Connecticut Valley. This system not only does away with all injury from pole sweat, but insures better and most uniform curing. Experiments with an improved system of ventilation for barns in the flue-curing districts have also given promising results.

In the export and manufacturing districts special attention has been given to the problem of securing an adequate supply of humus in the tobacco soils, which undoubtedly constitutes the key to improving the yield as well as the quality of the crop in nearly all these districts. This problem is of the greatest importance to the grower because of the fact that most legumes are likely to exert an injurious effect on the quality of the tobacco when preceding this crop in rotation.

An important feature of the tobacco work of the year has been a careful study of the effects of environment on the habits of growth of the plant and on the quality of the cured product, the principal object of this work being to afford a proper guide to the development of improved varieties by systematic breeding. The extensive studies relating to the plant-food requirements of the tobacco crop which have now been in progress for several years have been continued along the same lines.

INVESTIGATIONS IN POMOLOGY.

The work of identifying fruits has increased to a very large extent during the year, identifications being made of fruits from every section of the country.

A revision of the catalogue of the American Pomological Society is now under way. The value of this catalogue to the fruit interests of the country can hardly be overrated, since it has for years been the standard conservative authority upon the value of varieties for the whole country. The forthcoming revision will make the catalogue more comprehensive and exhaustive than ever.

Investigations looking to the simplification of fruit nomenclature have been pushed vigorously, resulting in the accumulation of several thousand card references to the history, origin, distribution, synonymy, description, classification, etc., of the cultivated fruits of the country.

The collection of fruit varieties at the Arlington Farm has been materially increased during the year. The collection is furnishing admirable opportunities for obtaining information at first hand concerning the relative merit of varieties.

Special attention has been devoted to the Persian walnut. Effort is now being made to introduce foreign varieties, to the end that a thorough test may be made of those that give promise of meeting the demands for an extension of the area of cultivation.

FRUIT-MARKETING, TRANSPORTATION, AND STORAGE INVESTIGATIONS.

Investigations on the marketing, transportation, and storage of fruit have consisted mainly of a study of the relation of handling methods to decay and deterioration in oranges and pomelos in Florida; table grapes, oranges, lemons, and apples in California;

and cherries, fresh prunes, and red raspberries in Oregon and Washington. The investigation of different methods of precooling table grapes, red raspberries, cherries, and fresh prunes in advance of shipment is also an important feature of this work.

The general principles underlying the relation of careful handling to the sound shipping and holding qualities of fruits have been found to apply to all classes of fruits thus far investigated, including even such perishable products as cherries and red raspberries.

VITICULTURAL INVESTIGATIONS.

The experimental vineyards established in different sections of California continue to yield important results, especially in determining the adaptability of various *Vinifera* grape varieties to different soil and climatic conditions.

FRUIT-DISTRICT INVESTIGATIONS.

The fruit-district work has been extended to cover the regions of Oklahoma, Kansas, Nebraska, northern Texas, and portions of New Mexico and Colorado. Ten years' phenological data have been accumulated and the results are being tabulated.

ARLINGTON EXPERIMENTAL FARM.

The Arlington Farm, which is the department's field laboratory in plant industry, is the largest intensive enterprise of this character in America. The farm is equipped with barns, tool sheds, and modern implements and is manned with men and teams for conducting the field investigations of more than 20 distinct offices and bureaus of the department. Besides this equipment there is upon the farm a bank of greenhouses consisting of 20 separate rooms or units devoted to experimental research work. A modern gravity brine-system cold-storage plant with a capacity of 700 barrels has been installed. Two types of drying apparatus, one for steam and one for direct currents of hot air, have been provided, as well as a plant for sterilizing soil and boiling spray mixtures.

TRUCK-CROP INVESTIGATIONS.

The development and maintenance of standard commercial varieties of vegetables particularly adapted to specific purposes is well under way with lettuce, cauliflower, cabbage, beets, tomatoes, and potatoes. During the last year standard commercial varieties of potatoes have been grown in each of the important commercial potato-growing regions. This stock has all been grown on the hill-selection tuber-unit basis. The work under way in the development

of new varieties exceeds that of any former undertaking. There are in this collection over 25,000 distinct specimens or varieties.

The peanut investigations have caused rapid extension of the industry. From a beginning of a few hundred acres in 1908 the crop this year will require more than 300,000 acres in the Gulf States alone, where prior to the time mentioned no commercial industry existed.

GREENHOUSES, GARDENS, AND GROUNDS.

Two additional greenhouses of a temporary nature were added during the year, one being used to care for the citrus-fruit collection and another for physical investigations. A number of the worn-out asphalt walks in the grounds were replaced and worn portions of the macadam roads repaired. In order to avoid any possibility of danger from frost should there be a break in the underground heating main from the central power plant, two large second-hand boilers were installed adjacent to the greenhouses. Much attention was given to the lawns adjoining the department buildings in order to maintain them in good condition. A number of additions were made to the ornamental plantings upon the grounds.

OFFICIAL COTTON GRADES.

The preparation and distribution of the nine official grades of white American cotton, as provided by law, has been an important feature of the work of the Office of Plant Technology. These grades have been officially adopted as the basis of their operations by nine cotton exchanges, while the New England Cotton Buyers' Association and the Arkwright Club have agreed to make them the basis of all their purchases.

A meeting of the Southern Cotton Buyers' Association was held in Memphis, Tenn., at which it was unanimously agreed that the official grades would be made the basis of all quotations to these New England organizations. The representatives of several exchanges which have not formally adopted the official grades participated in this action.

The official grades have now been on sale for a little more than one year, and the number of orders received in the last half of this period is one-third greater than in the first half. Because of the increased demand and the perfection of facilities for the preparation of the grades, it has been found practicable to reduce the price of a full set to \$30.

The work of placing 50 sets of these grades in vacuum storage for use as working duplicates in future years is being actively prosecuted. It is believed that by this means it will be possible to preserve indefinitely the exact standard which was originally adopted. This

has never before been accomplished, and the inability to preserve the integrity of the standard adopted has been one of the principal causes of the failure of the attempts heretofore made by the various branches of the cotton industry to agree upon a uniform standard of classification.

With a view to encouraging improved methods in the ginning and handling of cotton, experimental and demonstration work on a commercial scale has been undertaken. It is hoped that these experiments will give an accurate measure of the increased value which can be given to the cotton crop by a more careful regulation of the speed of the ordinary cotton gin, by better bagging, the protection of cotton from exposure to weather, and by securing greater uniformity within the bale. The effects of storing seed cotton under different conditions and for different periods are also being investigated.

The improved method of measuring the length of cotton fiber which has been developed has justified all that has been hoped for it. The method has been demonstrated before important gatherings of prominent members of the cotton industry, and has been received with great interest and pronounced approval.

PAPER-PLANT INVESTIGATIONS.

During the year a total of about 3 tons of paper has been made from cornstalks, broom-corn stalks, nonsaccharine sorghum stalks, rice straw, properly retted and overretted hemp stalks, sorghum bagasse, canes from southern canebrakes, "rice-root" grass tops, and fish-pole bamboo. Good qualities of book paper resulted in practically all cases, and several of the materials have proved sufficiently promising as to yield of pulp and quality of paper to warrant more detailed investigation.

The results with cornstalks have been more encouraging, as higher yields of pulp in proportion to raw material have been secured. Special attention has been paid to securing food-extract by-products that may be used in feeding cattle. Several hundred gallons of cornstalk extract evaporated to the consistency of molasses have been produced, and preliminary feeding tests have been carried on with dairy cattle and hogs. From these it appears that the extract may have considerable nutritive value. The value of this by-product and the cost of securing it will probably determine whether or not cornstalks can become an important paper-making material in the near future.

FIBER CONGRESS IN JAVA.

In response to a request from the Netherlands Government, the botanist in charge of fiber-plant investigations was sent as a delegate to represent this Government at the International Fiber Congress

and Exhibition at Surabaya, Java, held in July, 1911. The Fiber Congress itself was the first international gathering that has been held for the general discussion of the production of plant fibers. The subjects were ably discussed by men who for the most part are actually engaged in operating fiber plantations and who therefore have an intimate knowledge of the many problems met with in the industry and also the many practical ways in which these problems are solved.

GRAIN STANDARDIZATION.

The results of the grain-standardization investigations pertaining to the methods of harvesting, handling, transporting, storing, and grading grain have been of unusual interest and value during the year. In this work special attention has been given to the methods of handling grain on the farm, in elevators and warehouses, and by transportation companies, including a study of the changes which take place in grain while in storage or during transit in cars or steamships, together with a study of the relative value of the factors taken into consideration by grain dealers and the manufacturers of grain products in fixing values and grades of commercial grain. These investigations have likewise included some preliminary work in the rice fields of Louisiana and Texas on the methods of handling and grading rough rice, with a view of reducing the immense losses now experienced in handling this important crop.

Continued investigations during the year have fully confirmed the conclusions originally drawn that moisture is the most dangerous factor in the handling of commercial grain. Extensive experiments made to determine the natural shrinkage of grain when handled in elevators or warehouses or while in transit in cars have shown losses in weight due to the evaporation of moisture ranging from one-tenth of 1 per cent to more than 7 per cent.

Detailed tests of more than 10,000 representative samples have shown that a very high percentage of the 1911 crop of corn contained more than 20 per cent of water at the time of marketing, thus emphasizing the urgent need of better methods of handling grain on the farm and of growing types of corn that will mature sufficiently early to permit the grain to be marketed in a dry, sound, and more satisfactory condition. The degree of deterioration in corn alone, due primarily to excessive moisture, results in a loss equivalent to more than a million dollars annually, much of the corn handled commercially becoming musty, sour, hot, and badly damaged.

During the latter part of the year an informal invitation was extended to grain exporters and representatives of railroad and steamship companies interested in the handling of export grain to participate in an informal conference at the department for the

purpose of discussing the results of special observations on seven cargoes of export corn aggregating more than one and one-half million bushels. This invitation met with a most cordial response, and the 29 delegates present took an active part in discussing the results of these investigations, with a view of improving the quality and conditions of American export grain.

SEED-TESTING LABORATORIES.

On account of the provision for seed testing made by State laws in North Carolina and Nebraska, cooperation with these States has been discontinued, and two new laboratories are being opened in connection with the agricultural experiment stations in California and Louisiana, the laboratories in Missouri, Oregon, and Indiana being continued.

Hairy-vetch seed, which has this year for the first time been collected for examination for adulterants, was frequently found to contain seed of cultivated varieties of spring vetch, the latter generally being useless for fall sowing on account of winterkilling. An examination of the hairy-vetch seed-growing section of northern Germany and northwestern Russia shows that on account of the difference in time of ripening it is impossible to harvest seed of cultivated forms of spring vetch and hairy vetch together, the former being used as an adulterant. The *Vicia villosa* seed originating in the Baltic Provinces occurs as a volunteer in winter rye and is separated as cleanings from the rye.

PROGRESS IN CORN INVESTIGATIONS.

Requests for information concerning the corn crop, received by the department, were much greater in number and variety than during any previous year. In cooperation with interested farmers in many of the principal corn-growing States work is in progress which has as its object the development of higher yielding strains of corn. In connection with this work demonstrations are made of methods of breeding, methods of seed selection and preservation, methods of planting and cultivating, as well as tests of soil preparation and tests of cover crops. This cooperative work with individual farmers has resulted in the development of a number of higher yielding strains of corn and in stimulating throughout the localities an interest in better methods and higher acre yields. In a number of instances this work has resulted in a very noticeable increase in the production of corn per acre throughout the community.

There is perhaps no other crop capable of giving so profitable a return from both investigation and demonstration work. The past

season's work shows more plainly how very responsive this crop is to judicious treatment and how very little we have systematically studied its requirements. When the conclusive demonstrations conducted during the year in a few localities are conducted in many localities, a sufficient percentage of corn growers will profit by the demonstrations to cause a general improvement in the acre yield of corn.

CEREAL IMPROVEMENT.

Adaptation and breeding work with all the cereals has been continued during the year with special emphasis on the production of hardier and more drought-resistant varieties and strains. The superiority of many of the drought-resistant cereals was markedly shown in localities where drought was severe. The Turkey and Kharkof varieties of winter wheats did especially well, while Swedish Select oats and Ghirka spring wheat showed much superiority over less resistant varieties. The total production of the Kharkof wheat in the United States must be at least 40,000,000 bushels. Durum wheat continued to be the leading grain crop in the dry wheat-producing sections of the West and Northwest, where winter varieties are not yet dependable. The use of durum wheat flour is steadily increasing, and this product can now be purchased in a number of eastern cities. The season's work has furnished some good results with proso millets, particularly under irrigation, but also under dry-land conditions. Emmer, because of its better adaptation, still gives evidence of being a valuable crop in localities a little too dry for other stock food, such as oats and barley.

For the work in dry-land grain investigations two new experiment farms have been added, one at Burns, Oreg., and one at Aberdeen, Idaho. These farms will be managed in cooperation with the experiment stations of these States. During the year, for the first time, experiments with grains under irrigation have been undertaken. These experiments are conducted at points where it is possible to compare the results obtained with similar varieties under dry-farming conditions.

The grain sorghums are proving increasingly important as stock foods for dry-land areas. The dwarf and early varieties, such as Dwarf milo, Dwarf Blackhull kafir, Sudan durra, and the kowliangs which have been bred and distributed by this department are giving surer yields under conditions of greater drought than were formerly possible. They also permit the extension of these grains into more northern States, as South Dakota, Idaho, and Oregon.

In rice investigations in the South special attention has been given to solving the problem of controlling red rice by proper rotations and cultivation. In California experiments with rice were conducted at nine different points, and the results already obtained indicate

that commercial rice production may be possible on large areas in the Sacramento Valley and on smaller areas in the San Joaquin Valley. Preliminary irrigation experiments with rice show the probability of obtaining more profitable yields of this crop with much less irrigation water than is commonly used. Promising results have also been obtained in the investigation of growing rice without irrigation on the prairies of Florida. Experiments with Arlington Awnless winter barley have progressed with considerable success. Seed of this hybrid has been sent to all the experiment stations in the South and West where winter barley would likely be adapted, and in many cases excellent success has been reported. Owing to its high stooling qualities this variety gives promise of becoming very productive.

DRY-LAND AGRICULTURE INVESTIGATIONS.

Another year of severe drought throughout a considerable portion of the Great Plains region has shown the value of the investigations in crop rotations and cultivation methods in this area. These investigations have shown that, while much may be accomplished in the way of moisture conservation by proper methods of cultivation, none of the much-advertised methods and "systems" which have been so vigorously exploited through the public press can insure crops against droughts as severe as those experienced at some of the stations during the last two seasons. At those stations where the drought was less severe some remarkable differences in yields were obtained where proper methods of cultivation and crop sequence were followed. The results of the past season's investigations strongly confirm the tentative conclusions published in Bulletin No. 187 of the Bureau of Plant Industry. They also disclose several new problems which demand solution and which will be attacked during the coming season.

The high appreciation of this line of work by those interested in the agricultural development of the Great Plains was evidenced by the substantial increase in the appropriations made by the last Congress for its development and extension. The Comptroller of the Treasury has ruled, however, that, owing to a slight defect in the last appropriation act, the funds appropriated "for the investigation and improvement of methods of crop production under semiarid or dry-land conditions" can not be used for the erection of buildings necessary for carrying on these investigations at the field stations. It is hoped that the next Congress will remedy this defect early in its session, in order that the current appropriations may be used for this purpose. If this is done, active operations will be begun at several new stations early in the coming spring. These stations are located in Fall River County, S. Dak.; near Tucumcari, N. Mex.; and in the southern portion of the Panhandle of Texas. It is absolutely essential to the development of this important line of investigations that

suitable buildings be erected, and unless the funds already appropriated are made available for this purpose the contemplated extension can not be made until July 1, 1912, thus causing the loss of an entire season's work at these new stations. Such a delay at this time would be very unfortunate, as these stations are in localities where the drought has been very severe for the last two seasons and the settlers are therefore in urgent need of all the assistance that can be given them by this department.

WORK OF THE FIELD STATIONS AT THE RECLAMATION PROJECTS.

The opening of the reclamation projects to settlement has disclosed many problems of a local character which must be solved before these projects can be brought to their highest state of productiveness. In order to assist in the development of this region, the department has established experimental farms upon the following projects: Yuma (Arizona, California), Truckee-Carson (Nevada), Umatilla (Oregon), Huntley (Montana), North Platte (Nebraska), Williston (North Dakota), and Bellefourche (South Dakota). Experiments to determine the tillage methods and crop rotations best adapted to the conditions constitute an important part of the work at these stations. Special attention also is given to the utilization of native forage and fruit plants and to the testing of special crops that seem peculiarly fitted to the different conditions.

Irrigated regions present problems in plant nutrition and crop production that are not met elsewhere. A marked diminution in yield after cultivation for a few years is by no means an uncommon experience in irrigated regions. These troubles are often the result of the translocation of the large amount of soluble material that is usually present in irrigated lands, but there appear to be other causes not well understood which give rise to a condition of malnutrition in the growing crop. Particularly is this to be seen in the case of irrigated orchards. It is highly desirable to undertake at once a comprehensive investigation of the conditions giving rise to malnutrition of crop plants in irrigated regions if we wish to maintain our irrigated lands in a high state of productiveness.

Some serious pathological problems have also developed on some of the projects, notably a disease of the potato which has proved very disastrous on the North Platte (Nebraska) project. These problems are undoubtedly closely associated with the time and manner of applying irrigation water and also with the quantity of water applied. The previous crop grown upon the land seems also to be an important factor in causing these diseases to develop. These various problems and their interrelation are to be carefully studied through cooperation among the several offices of the Bureau of Plant Industry having charge of the respective lines of investigation.

FORAGE-CROP INVESTIGATIONS.

Notwithstanding the fact that rapid and material improvement has been made in agronomic methods and in practically every phase of farming, almost no advancement has been made in the management of farm pastures. This is apparently due to the lack of a full appreciation of their value, for it is a fact that pastures will stand neglect to a greater extent than any other portion of the farm and that the results of care and treatment are not so readily noticeable as in the case of cultivated crops. The careful investigations that have been under way for the last four years are now beginning to point to methods of management that will very materially increase the income from pastures that are now unprofitable. The optimum rate of grazing pastures seems to be one of the most important factors in connection with their management. In carefully conducted tests very light grazing as well as very heavy grazing has proved injurious. The value of alternate grazing and surface cultivation has been measured under carefully controlled conditions, and data have been accumulated to form a basis for reliable recommendations.

A new forage crop to become popular in any section must possess points of superiority over forage crops that are already well established. This season two new grasses, Rhodes grass and Sudan grass, have proved to be so superior to other grasses for the same conditions that they are being accepted at once in sections where they have been tested.

The ability of Rhodes grass to produce heavy yields of palatable and nutritious hay in Florida and other parts of the Gulf coast region, where a good hay grass is a valuable desideratum, makes this grass one of the most promising of recently introduced plants.

Sudan grass, introduced from Africa, is another example of a new forage crop that has become popular almost in one season. This grass apparently possesses all the valuable characteristics of the well-known Johnson grass without being at all troublesome as a weed on cultivated land. Sudan grass is an extremely promising grass not only for the South, where Johnson grass is now being grown, but also for sections farther north as an annual crop to replace millet. It is a very drought-resistant species and gives heavy yields of good hay.

A new variety of velvet bean promises to become a valuable crop for forage and soil improvement in sections that are considerably north of those now producing the Florida velvet bean. While further tests of this variety are necessary to determine its value and northern limit, the present indications are that it will become a very popular and profitable crop as far north as southern Arkansas.

INVESTIGATIONS IN FARM MANAGEMENT.

This important work will be grouped under four principal heads: (1) Studies of farm practice; (2) cost accounting and farm records; (3) farm equipment; and (4) farm problems, or extension work. In the studies of farm practice, much additional information has been secured concerning the relation of farm practice to crop yield, the relation of methods of tillage to crop yield and to soil and labor conditions, and the relation of cropping systems and methods of tillage to weed control. Particular attention has been given to the relation of crops to the general distribution of labor on the farm. An important phase of the work of farm management has to do with the problems of the farmer or the application of all the data secured to the individual farm. From most of these farms similar records were secured last year. These records show the cost of every kind of farm operation under widely varying conditions of management. They also show the dates at which all work is done and the number of men and horses required to perform each operation economically, and hence they are of great value in formulating working plans for farms. A careful study has been made of the capital invested, the elements of cost, and the sources and amount of income on all farms in several representative townships in three Middle Western States. These studies give important information on the types of farming best adapted to that section, the relation of successful management to the training and education of the farmer, the average percentage of profit on the investment, the relation of profit to the seasonal distribution of labor, and many other important problems connected with the organization and conduct of the business of the farm.

Studies of the character and cost of all phases of farm equipment and the distribution of capital among the elements of equipment, such as land, buildings, fences, live stock, and implements and machinery, have been conducted on a large number of farms in several widely separated localities. In connection with the studies of cost accounting and farm records, investigations have been made of all the operations on a large number of farms. The reorganization and redirection of agriculture in the various sections of the country is a task calling not only for broad knowledge of the sciences which are fundamental in agriculture, but also for an intimate knowledge both of farm practice and of the problems confronting the farmer in any given section. Changes in farm practice in many localities are imperative for the good of the farmer as well as for the general welfare. In many places the practice of unwise methods has resulted in marked decrease in the yielding power of the soil. In nearly all of the older States there is a noticeable decrease in rural population. The growth of urban population and the development of transpor-

tation facilities have made important changes in the demand, and hence in prices, of farm products, rendering changes in types of farming desirable and necessary. The problem of tenant farming is pressing for solution. As the older men retire, the young men having largely entered other callings, it becomes necessary to rent the farm. The tenant is usually without the capital necessary to equip for live-stock farming; he therefore exploits the farm and then moves on to exploit another. This problem must receive attention. Systems of tenant farming must be evolved that will give consideration to the future productiveness of the soil.

The necessity for important modifications in farm practice and the reorganization of the agriculture of many sections is becoming generally recognized and public interest is being awakened. This is one of the most important phases of the work of this department. An organization has been formed and men have been trained to lead in this work. We are now ready to extend this work. In doing this we propose to cooperate as closely as possible with all those agencies in the several States which are interested in work of this character.

FARMERS' COOPERATIVE DEMONSTRATION WORK.

The farmers' cooperative demonstration work has been developed into a system for carrying information to the farmer on his own farm. It has as two of its strongest points the carrying on of demonstrations in the production of standard crops under the best-known methods on the land of the farmer being instructed and the securing of such active cooperation in the demonstration on the part of the farmer as to bring about the adoption of the method advocated. After seven years of experience and development it has grown into a great and successful institution. Not only has it been successful in showing the southern cotton farmer how to meet the ravages of the cotton boll weevil, but it has spread abroad through southern agriculture lessons of great value, and rapid strides are being made in that section in diversified farming, the keeping of live stock, and the building up of soil fertility. From the great extent of this work and the years of experience the department has had with it, it may safely be said at this time that when intelligently directed this method of disseminating agricultural knowledge proves successful and secures the allegiance of the educated and progressive farmer as well as the poorer classes and negro tenants.

One important branch of this work has been the boys' corn club movement. This has attracted much attention, and has served as a means of stimulating general interest in better agriculture in the South and better knowledge of its great agricultural resources. Corn clubs were organized in other States for some years before they were started by this movement in the South, but nowhere have they

been organized more systematically or successfully. The numbers have increased from a small beginning four years ago until the present enrollment is practically 60,000. Prizes are awarded for excellence in growing corn on one acre to be contested for by boys organized into clubs in cooperation with the public-school system of States and counties. The prizes are contributed either in money or useful things by merchants, commercial organizations, public-spirited individuals, and others. One of the strong features has been the method of awarding prizes, the prizes not being given to the boy who raises the most corn on his acre, but the practical and educational value of the lesson is kept in mind, and in making up the award emphasis is given to best yield, minimum cost of production, quality of corn produced, and best written report of the undertaking. The prize winner in each State as a rule has part of his reward in a prize trip to Washington, where the boys gathered from the several States receive much attention and have opportunity to see and study the interesting things in the Capital City. These clubs are helpful in attracting the attention of the young men to the advantages of farming as an occupation, in waking up the older farmer to the advantages of better methods of production, and in assisting the public-school system in vitalizing rural education. In the States of North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, and Arkansas this boys' corn club work has been carried on by the Farmers' Cooperative Demonstration Work in direct cooperation with the agricultural colleges of each of those States.

As the home is the all-important feature of farm life and is closely associated with its economy, it has been thought wise to help the girls as well as the boys. The problem of the production of home supplies is close to the home. With the great possibilities the South has for the production of vegetables and fruits and with the modern conveniences accessible for canning and preserving them, it is possible to have provisions of the best kind the year round. This and the keeping of poultry go far toward relieving the wrong side of the family ledger. Girls' canning and poultry clubs have been organized by the department in cooperation with colleges of agriculture and other institutions in the South, the object being to instruct the girls in the best methods of raising the ordinary garden vegetables, canning the same for winter use, and the care and keeping of poultry. This work is financed by the General Education Board of New York, with the hearty financial cooperation of the agricultural colleges of the South, and to it, through the demonstration work, the department is lending its guiding assistance. This work has only just begun. Prizes are offered in the same way as in the corn clubs, and the girls and farm women of the South are showing great interest in this branch of the work.

PROGRESS IN PLANT INTRODUCTION.

The striking fact that the vast majority of valuable varieties of our cultivated crop plants have originated by chance and been discovered by private individuals seems to warrant the encouragement throughout the country of private testing gardens as well as official ones, in which newly introduced plants can be grown and closely watched by intelligent and interested people. It is not deemed expedient as a policy to support these testing gardens with Federal funds, but to supply the plant material which is propagated in extensive propagating gardens, and in this way encourage the building up of permanent collections and arboreta which shall be supported by State appropriations or private endowments.

In order to encourage those thoroughly interested in the testing of new plants and their use in the creation of new varieties, plant introducers are sent out to visit the various gardens and bona fide private experimenters. They arrange for the placing of the valuable plants, interpret the results, suggest new and promising fields of investigation, and report on the demands for foreign plants with which to work.

In addition to the State experiment stations, permanent places for the testing of long-lived perennial plants have been found in city parks, the grounds around many public institutions, and the farms connected with the Indian reservations. By this method a wider circle of experts and amateurs is being reached than would be possible by the building up of a few large collections, in that it brings to their own gardens new plants upon which they can experiment and which they can breed with our native species.

An agricultural explorer has during the year explored the cold dry regions of Chinese Turkestan and crossed the Tien Shan Range into Siberia and obtained wild apples, pears, bush cherries, and other fruits and forage plants which can not fail to be of value to the breeders of hardy plants in the Northwest.

CONGRESSIONAL SEED DISTRIBUTION.

Seeds and plants were distributed upon congressional order as in former years. Between six and seven hundred tons of vegetable and flower seeds, put up in approximately 60,000,000 packets, were distributed the past season. Of this quantity about 10 per cent was flower seed and 90 per cent vegetable seed. Approximately one-third of the total quantity was procured from surplus stocks, and the remainder was grown under contract for the department during the current season. In every case seed was secured on competitive bids, and no seed was accepted for distribution unless it was found after repeated tests to be of satisfactory purity and vitality. Every lot

of seed is tested for germination two or more times before and after shipment, and a sample of each lot is grown on the trial grounds of the department under the direct supervision of expert horticulturists to determine its trueness to type. Many thousand pounds of vegetable and flower seeds which do not meet the requirements of the department are rejected every year and returned to the seedsmen by whom they were shipped. Where seeds are contracted to be grown for the department the fields are inspected at the proper season by specialists, who see that the plants are uniformly true to type and that a proper system of roguing out variations and mixtures is followed. This system has resulted in steady improvement in the quality of seeds distributed by the department, as shown by the results obtained on the trial grounds and by hundreds of reports from all sections of the country.

The work of packeting, assembling, and mailing the vegetable and flower seeds was done under contract at a cost of \$1.10½ per thousand packets, which included delivery of the packeted seed in mail sacks direct to the Union Station. A new contract has been entered into for putting up and mailing the seeds for the coming distribution at a saving over the former contract of 1 cent per thousand packets.

Approximately 12,000 pecks of four improved varieties of Upland cotton developed by the department were distributed in the cotton-growing States last season. The continued distribution of these improved cottons, with the accompanying circulars which contain detailed instructions for the home selection and improvement of seed, has resulted in widespread interest in seed selection in the South.

The propagation of Dutch bulbs in the Puget Sound region in connection with the congressional distribution is progressing favorably. Trial sets of narcissus and tulip bulbs propagated near Bellingham, Wash., were planted at Washington, D. C., with sets of bulbs of the same varieties imported from Holland, and the Bellingham bulbs produced better blossoms 10 days earlier than the imported bulbs. The early blooming period of American-grown bulbs is of importance to all professional florists, because of the saving in time and fuel where bulbs are forced for market.

BUREAU OF CHEMISTRY.

FIELD WORK AND SCIENTIFIC STUDIES ON HANDLING POULTRY AND EGGS.

The Food Research Laboratory has for another year pursued its policy of working out in the laboratory the fundamental scientific facts pertaining to the handling of poultry and eggs and of applying these facts to industrial problems by practical work in the field with all

the branches of the industry. No problem of gathering, killing, chilling, shipping, holding, etc., is without meaning in this investigation, and all the work done has been of value to the consumer and to the industry in the betterment of the product and in securing more stable financial returns. Throughout the industry there is not only the spirit of cooperation, but an effort to push the inquiries and obtain information as rapidly as possible because of the growing appreciation of the value and the necessity for work on the betterment and conservation of perishable foodstuffs. The specific problems attacked this year have included a comparison of the effects of "dry packing" with water chilling and "ice packing," extensive field and shipping experiments having been made from plants in Atchison, Kans., and in Nashville, Tenn., to New York, with careful inspection and laboratory examination from the killing until marketing is completed. The results obtained are of the utmost practical value, and in the course of the work a mass of scientific data on the composition of fresh chicken flesh and the bacterial and chemical changes in same due to temperature have been obtained. The same data under conditions of routine marketing have been determined. Other problems of handling have included methods of killing and a comparison of the rate of decomposition of drawn and undrawn poultry, based on experimental work and bacteriological and chemical examinations, while some of the transportation and storage features of the problem have been discussed.

The practical results of the scientific work and the industrial application of the same are given to the industry as promptly as the facts become a certainty. Publication of the details of all the work is made according to the class of readers to which it especially applies. But the essential facts, which will help at once to get better poultry to market, are given to individuals or organizations or in answer to inquiries whenever they can be helpful, since this work is essentially for immediate betterment all along the line.

A demonstration of killing, picking, chilling, packing, and shipping poultry and also of the details of candling and handling eggs was given at the present field laboratory, which is in a packing house at Nashville, Tenn. The interest manifested by the shippers, their keen appreciation of what the work meant to them, and especially of its value in the development of the poultry and egg industry in Tennessee and Kentucky, was extremely encouraging. This demonstration was followed by an illustrated talk in New York, that the receivers might know of practices prevailing in the producing sections and have a more definite knowledge of the reasons for the condition of their poultry receipts. As a practical supplement to this talk a shipment of poultry killed 1,000 miles from New York, dressed in various ways and shipped under refrigeration, was exhibited in

one of the chill rooms of a refrigerated warehouse, the birds showing, even to a casual observer, the difference in condition due to different modes of handling.

The studies of the handling of eggs and the preparation of the frozen and desiccated products are proceeding along lines similar to those followed in the poultry investigation, but as yet they are in an incipient stage. The frozen-egg investigation has met with the hearty support and cooperation of the progressive men of the industry. Everyone familiar with weather conditions and egg handling as at present conducted in the Central West knows that the waste of this most valuable foodstuff is appalling. It is imperative, in the face of the growing shortage of our food supply, that this waste be lowered by every means possible. Many eggs wholesome when received by the shipper are rotten after the long railroad haul to the center of consumption. Such eggs should have been wholesomely conserved for food, and, on the other hand, eggs which have deteriorated below the food line must not be packed for food purposes by the careless, incompetent, or greedy packer. This, like the general poultry and egg handling problem, is a problem of, first, scientific investigation, and, second, practical education and application of scientific principles. The present efforts are "breaking prairie" in the broad expanse of work to be done on the betterment and conservation of perishable animal products. So far the results have amply upheld the methods used. The plans for future work are comprehensive, and because of a growing understanding of the problems to be met and the methods available the results to come should be increasingly valuable, both economically and from the standpoint of public health.

FRUIT PRODUCTS.

Economic studies on the utilization of surplus fruit juices and the yields obtained by preparing the juices of various fruits in different ways have been made in collaboration with the Bureau of Plant Industry on a scale rendering the results commercially practicable. Special points considered were the effect of sterilization on the flavor of citrus fruits, the preparation of dried sugared pineapples on a large scale, and a laboratory investigation of the ripening of persimmons without softening, which is to be extended to field work, since the results indicate that instructions for commercial processing may be given which will greatly increase the market for this fruit. The studies on fruit respiration have included this year the effect of temperature on vital processes, the results being of economic value in their bearing on the storage and transportation of fruit.

The manufacture of citric acid, oils, etc., from waste citrus fruits has been made the subject of a laboratory investigation, mechanical devices for lessening the cost of production have been planned, and the results will now be tested by experiments on a commercial scale.

In the Enological Laboratory economic studies in the utilization of waste apples and grapes and the improvement of the by-products of these crops are made. To this end the composition of American grapes and apples in the different fruit districts of the country is determined, and a critical study is made of commercial samples in comparison with pure products of known history. The study of yeasts and the preparation of pure cultures for practical use in producing high-grade ciders, etc., is an important item in improving quality. These yeasts were distributed to 13 of the chief fruit-growing States during the year for experimental use by persons interested in the production of fruit by-products. A permanent laboratory at Charlottesville, Va., and a field laboratory at Sandusky, Ohio, make it possible to perform this work in a practical as well as a scientific manner, insuring results of value to the growers and manufacturers.

INSECTICIDES AND FUNGICIDES.

The investigations to discover new insecticides and improve those in use so that their efficiency may be increased and the injury to trees and fruits diminished may well be included among the important economic chemical investigations, inasmuch as the saving to the farmer, both in initial expense and in protection of the crop, is enormous. Exhaustive investigations along this line have had to do with the solubility of Paris green and lead arsenate in water, involving 3,500 arsenic determinations; the problem of fumigation with hydrocyanic acid gas, the results of the study, which are of considerable economic importance, being already published as Part III of Bureau of Entomology Bulletin 90; and the accumulation of toxic compounds in the soil as the result of using poisonous elements, especially copper and arsenic, in sprays. A new phase of this work, which should result in marked improvement of the commercial insecticides and fungicides found on the market, is the chemical and microscopic examination of these materials under the insecticide act, which went into effect on January 1, 1911, and aims to prevent the misbranding and adulteration of these commodities. In connection with this work about 418 samples were examined, involving some 2,800 determinations, the greater part of these being made at the request of the Bureau of Entomology. The improvement and discovery of suitable methods of analysis for the perform-

ance of this work is of fundamental importance, and much time is devoted to researches of this kind, about 600 determinations having been made to this end during the year.

CONSERVATION OF TURPENTINE, ROSIN, ETC.

The work which has been in progress for several years on wood turpentine and other products obtained in the distillation of wood has been so far advanced that its publication is deemed advisable. This work shows how the number and value of the products obtained in the distillation of wood can be increased, how the quality of the products may be improved, and the cost of the products decreased. Properly refined wood turpentine has been found to be a suitable paint and varnish thinner for all but the highest grade varnishes, and it may safely be used by the workman in well-ventilated places.

The work on the misgrading of rosin has developed the fact that such misgrading is largely due to the practice of cutting the samples on which the rosin is graded too large, and also to the fact that the standard type samples with which the rosin to be graded is compared rapidly bleach out and become lighter in color under the severe climatic conditions existing in the South. The indications are that in the neighborhood of 400,000 barrels of rosin are annually misgraded from the above-mentioned causes, and the loss occasioned by such misgrading is chiefly at the expense of the rosin producer. In order to prevent this as far as possible, a simple device has been prepared with which the producer of rosin can himself accurately grade his product and in this way check the subsequent official grading.

EXAMINATION OF CONTRACT SUPPLIES.

The testing of deliveries to the various Government departments of paper, textiles, leather, turpentine, rosin, and other materials has steadily increased, thus showing a gratifying appreciation of the help which the Bureau of Chemistry can render the other departments. Frequent calls for advice in the purchase of the above-mentioned materials and for service on inspection committees are received, and the assistance which has been rendered in the preparation of specifications and in the testing of supplies has saved thousands of dollars annually to the Government. These specific materials are examined in the Leather and Paper Laboratory, all other contract supplies being examined in the Contracts Laboratory, devoted exclusively to such work. A total of 2,309 samples were examined in the Contracts Laboratory last year. Of these over 1,300 were colors,

paints, fats, and oils, principally for the Bureau of Engraving and Printing; 301 samples were examined for the Department of Agriculture; 1,217 for the General Supply Committee; and 310 for the Isthmian Canal Commission.

INSPECTION OF FOODS AND DRUGS.

The inspection force of the Bureau of Chemistry collected 9,500 official samples of foods and drugs during the fiscal year, and 2,000 additional samples for use in scientific investigations relating to the enforcement of the food law, providing data on which 312 seizures were based. Each of these samples was referred to the appropriate laboratory at Washington or to one of the 21 branch inspection laboratories, the reports from the latter points showing that 3,280 interstate samples were found to be legal and 3,113 misbranded or adulterated, while 503 check analyses were made to insure that correct results were obtained before recommending action on the samples. In connection with this work 5,370 hearings were held, less than half being by correspondence. There were 96,129 floor inspections made of imported products, of which over half were made at New York. A total of 9,698 imported foods and drugs were analyzed at these ports, of which number 3,085 were adjudged adulterated or misbranded and 1,268 were released without prejudice to future shipments. The miscellaneous samples examined at the branches aggregated 1,406, making a total of 18,000 samples.

In this connection there must be considered the analyses made at the Washington food and drug inspection laboratories and at the special laboratories handling specific classes of materials, such as the dairy products, waters, cattle foods, flavoring extracts, and essential oils. Here check analyses are made and all cases prepared for the consideration of the Solicitor, in addition to the original analyses made for inspection or investigation work. Approximately 752 samples are reported by the drug-inspection laboratories, of which 529 were domestic products; 231 of these were found to be adulterated or misbranded. The Food Inspection Laboratory proper reports 2,067 domestic samples and 1,097 imported foods, largely check samples on branch laboratory reports; in this laboratory 2,142 cases were prepared for consideration. In addition the Food Technology Laboratory reports 108 initial and check samples and 185 cases prepared on extracts and essential oils; the Dairy Laboratory reports 320 official interstate and import samples and the preparation of 347 cases; the Water Laboratory 200 samples, only 39 being of foreign origin, of which 11 were misbranded, while 39 of the 161 interstate samples were considered illegal and 6 seizures were made; of the 500 interstate samples of cattle and poultry foods 76 were found to be adulterated or misbranded. This total of 3,672

domestic and 1,302 import samples at the Washington office gives a general total of 22,974 samples examined in the course of the inspection work alone, including check examinations and other necessary duplications in the work.

DRUG INVESTIGATIONS.

The important cooperation with the Post Office Department in issuing fraud orders against medicinal agents sent through the mails and proved to be of a fraudulent or injurious nature has been continued. As in former years, the consumption, cancer, and epilepsy "cures" continue to form the most important classes of materials handled.

DAIRY PRODUCTS.

While the whole range of dairy products is covered by the examinations made, the evaporated and condensed milks and cheese formed the bulk of the samples examined at the Washington laboratory. An investigation begun in 1909 in regard to the concentration of evaporated milk was completed, and Food Inspection Decision 131 has been issued on this subject. Condensed milk, both sweetened and unsweetened, continues to be made in many instances from skimmed milk; the violations in the cheese trade consist most frequently in short weight or the sale of a skimmed cheese for a full cream. A total of 347 cases were prepared during the year on such products, nearly 200 of which are milks and creams, 44 cheeses, and 40 ice creams.

WATERS.

Mineral and table waters are examined both at source and as found on the market. As a result of the analysis of 161 domestic samples, 39 were found to be adulterated or misbranded and 6 seizures were made, while of the 39 imported waters, the exclusion of 11 was recommended. In this connection an extensive survey of the mineral waters of the United States has been undertaken and the data in regard to the waters of the New England States have been issued as Bureau of Chemistry Bulletin 139. This material is of the utmost value to physicians and consumers, especially those depending on the waters for any therapeutic effect, as well as to those called upon to pass on these waters in the enforcement of the law. Correlated studies include the analysis of public water supplies, investigations for the improvement of methods of water analysis, the character of chemicals used in water purification, etc.

CATTLE FOODS.

The studies of cattle foods and grains are by no means confined to the aspect of adulteration, since economic problems, such as the feed-

ing value of forage crops and the composition of grains and cereals, form the fundamental part of the work of the laboratory charged with this subject. Of the 891 samples examined, however, 500 were interstate samples of cattle or poultry foods, and 76 of these were found to be adulterated or misbranded.

SUGAR AND SUGAR PRODUCTS.

The investigation of maple products begun two years ago is nearing completion, the season for the work being so short that the yearly results obtained at the camps are necessarily limited. A mass of analytical data has been determined on samples collected in different parts of the country and manufactured under varying conditions. The data on maple sap sirup have been published as Bureau of Chemistry Bulletin 134, and those on maple sugar and maple-sugar sirup are being compiled. Numerous practical problems attending the collection of the sap and the manufacturing processes are being studied, notably the effect of souring of the sap and of the use of different materials for sap containers and evaporators on the final product.

The studies of the effect of environment on the composition of sugar-bearing plants was extended to include muskmelons, the work being conducted in eight different States, representing widely differing climatic conditions, from Florida to Connecticut and from Arizona to New Jersey. Valuable results, such as were obtained in the five-year experiments on sweet corn and sugar beets, are expected, but no conclusions can be based on one year's work.

Miscellaneous sugar investigations include work on the moisture content of Louisiana cane sirup and molasses, the adaptation of methods of analysis of sugar beets to commercial needs, the chemical examination of imported honeys, and the analysis of American glucose and starch sugars.

PLANT PHYSIOLOGICAL CHEMISTRY.

The influence of environment on the chemical composition of various cereals, such as wheat, rye, oats, barley, buckwheat, etc., is studied in analyzing the crops grown in different localities during a number of seasons and in comparing the data on composition thus obtained. Thousands of such analyses have been made, and a report is in progress. Wheat is also grown under varying conditions of sun and shade, and plants grown in the Great Plains area are examined to determine the effect on composition of different methods of handling the crop, especially the influence of rotation on production. The composition of different varieties of barley grown in

the same location for several years has been studied, and milling and baking experiments are supplementing the chemical work done to determine the comparative value of different wheats. The starch content of different varieties of potatoes is determined with a view to selecting the best varieties to be grown. These studies are made in collaboration with the Bureau of Plant Industry.

Important physiological studies have included experiments in growing cereals, usually wheat, for a few weeks in water solutions containing different plant foods, and, by the determination of their composition and that of the residual solutions, arriving at important data as to the physiological process of the young plant and its needs. In the same way the effects of different conditions are observed on the root formation of young plants, certain salts having been observed to have a deleterious effect.

The study of starches obtained from different plants, especially with a view to obtaining a more complete extraction than at present, an investigation of the graham flours on the market to determine whether they are mixed or straight, and baking and chemical tests of the availability of cottonseed meal, peanut meal, soy-bean meal, etc., in bread making, are miscellaneous lines of work pursued in connection with the other cereal studies.

ANIMAL PHYSIOLOGICAL CHEMISTRY.

The most important investigation along this line is perhaps the collection and analysis of about 30 different brands of infants' foods, supplemented by feeding experiments on small animals, using the commercial formulas for preparing the foods and also certain modifications. The detailed data are being collated, and some of the results already have been profitably used in charted form for the information of societies interested in this problem, which is of great importance in the conservation of public health. Other problems attacked by work along these lines include the methods of determining deterioration in meat and fish, a study of beef and yeast extracts of known and unknown origin, and the determination of the solubility in the digestive juices of the silver coatings used on candy.

FOREST SERVICE.

The notable features of the year have been the thoroughgoing attention given to improving the organization of all activities, both field and office, which has amounted to a complete overhauling of the entire administrative mechanism; better application to the National Forests of the fundamental administrative policy laid down for them by Congress, through the development of a steadily higher quality

of technical work; far more effective protection of the Forests against fire than ever before; marked advance in the silvicultural work, both in connection with the cutting of timber and in the field of reforestation; inauguration of work under the Weeks Act, looking to the purchase of lands for National Forests in the White Mountains and Southern Appalachians; and, finally, but by no means least, important progress in laying broad and sure foundations, by means of thorough study of underlying technical problems, for the eventual superstructure of applied conservation, or, in other words, for development of the full latent value of the Forests as public resources. Like all foundation work, what is done in this field is mostly below the surface and attracts little public attention; but it is going quietly yet vigorously forward and is already beginning to justify itself in results. Without such work National Forest management would be a shallow-rooted plant in an arid land.

ORGANIZATION.

From top to bottom the members of the Forest Service have been studying the possibility of improving the machinery and methods in use. One reason for this has been the need everywhere felt to utilize the funds available to the best advantage. All of the various lines of work have been scrutinized in an effort to discover where more economical methods could be employed without any sacrifice of efficiency. Beneficial results have been obtained principally along three lines: First, both the scientific work and the administrative and protective work have been put on a better basis through more careful organization; secondly, the supervisory force at Washington and in the six district offices has been materially cut down; thirdly, steps have been taken to gather better cost data, establish cost standards, and insure the maximum of result in all kinds of field work, through standardizing the work itself and obtaining a measure of its efficiency.

The only important change made in the general form of organization was the creation of a new administrative unit to handle the work in connection with land purchases under the Weeks Act. It was found that the opportunity for improving the organization lay not in radical alterations of the administrative machinery, but in a tightening of the various parts and a better direction of effort. A renewed impetus has been given the scientific and cooperative work, on which largely depends the development of the practice of forestry on privately owned timberlands (carrying four-fifths of the total timber supply of the country) throughout the United States.

The organization of the work on the National Forests under six district offices, effected three years ago, had for its immediate purpose closer supervision of field activities and the elimination of

delays in the transaction of business; but it had also in view the ultimate reshifting of much of the responsibility and the work then removed from Washington, out of the district offices to the Forests. To insure the application of proper technical methods and the setting of proper administrative standards, it was at first necessary to place in each district a considerable force of well-trained men. It was also necessary at the outset to provide for maintaining a considerable oversight of the district offices from the Washington office. Gradually the work of supervision both in Washington and in the districts has grown lighter, and the personnel changes thus made possible have reduced the overhead supervisory force by a third or more. A large part of these changes took place last year.

The study of costs and work standards and the effort to increase efficiency through better organization, more careful definition of the ends to be sought and the methods to be followed, and better time and output records has been taken up with enthusiasm by the rangers and supervisors as well as in the districts. Plans are being developed in many places for making the field work, and especially the work of the rangers, more effective. I believe that it would be difficult to find in any branch of the Government more energetic and loyal effort to develop and apply the methods which will mean the largest possible return in work accomplished for the money disbursed than now permeates the Forest Service.

ADMINISTRATIVE POLICY.

The act of June 4, 1897, which gave authority for the administration of the National Forests, also plainly indicated that Congress intended the reservations to be maintained, protected, and improved for the public benefit, and at the same time to be opened to use as public utilities, under regulations framed to conserve their productive value. The principal task involved in giving effect to the purpose of Congress with respect to the National Forests is that of developing their use. Their primary uses are to produce continuous supplies of timber and to regulate the flow of water. Subordinate to these uses, yet of large importance, are their use for grazing, for recreation, and for many kinds of occupancy. The regulation of use for these subordinate purposes must be so adjusted as not to prevent the carrying out of the primary purposes for which the Forests were set aside, while enabling the public to secure from them as many advantages as possible.

From the time that the National Forests were placed under my jurisdiction I have administered them with a view to the development of their largest public usefulness. Up to the time that they were taken over, little constructive work had been done. As they

have been set aside in order to insure that their benefits shall be permanent, their proper development necessarily involves the making of plans which look far ahead, and such control over present use as will prevent future loss of productive power.

The object of forestry is to conserve through use. It includes protection of the timber now standing, but it has for its main purpose continued production along with constant use. Without the application of forestry, use of the Forests is always accompanied by deterioration. Forestry means simply intelligent control of the processes of nature, in order to reap the largest advantage. It is comparable with the work of scientific agriculture, of which indeed it is a branch. Just as unintelligent farming brings about a decline in the productive power of the farm, so use of forests which is not guided by knowledge of the forces at work means impoverishment of forest resources. Everywhere in this country the contact of civilized man with the forests has brought abuse of the forests. This is as true of the National Forests as it is in the East, though not to the same degree. They declined progressively from the time of the pioneers until intelligent regulation of their use began. Though vastly the greater part of the National Forests are virgin, so far as timber cutting is concerned, they have been so desolated by past fires and injurious grazing that they are in far from the best condition. One of the tasks involved in administering them is to build them up.

Technical forestry is so new a thing in this country that the nature of its work is even now not clearly understood by the public. The long period required to bring a forest crop to maturity makes the intelligent management of forests possible only if present operations are shaped with a view to results which will follow many years subsequently. The entire scheme of management generally looks to the attaining of ends a century or more in the future. It is a question of organizing all operations under a constructive plan which must move forward a step at a time, each step coordinated with those which precede and follow, to the final fulfillment of its purpose. The forest must, through scientific knowledge of the laws which govern it, be slowly shaped into conformity with the plan. The relative amounts of growing timber of different ages, the kinds of trees, the volume of timber which will be available at different times, the development of transportation facilities, and the probable future market demands, both as to quantity and kind, must be carefully calculated. All of this means that the application of forestry requires a policy of management which, for a long period of years, shall be stable. The absolute necessity for a stable policy of management constitutes the strongest reason why Government ownership of productive forests is essential to the public welfare. To develop a

stable policy and attain the final goal, forest administration must be developed along technical lines.

During the nearly seven years that the Forests have been under my control I have built up a technical staff. This I regard as the fundamental achievement that has been attained. The immediate work ahead when the Forests came under my control was that of organizing an administrative system to provide for protection of the Forests, while opening them at once to as many kinds of use as possible. This immediate work, however, was undertaken with the purpose not of providing a temporary makeshift, but with an attack at once on the underlying problems of constructive development. Permanent foundations have been laid down.

The same necessity for a technical administration applies quite as strongly to the control of grazing through range management as to forest management. Unlike the National Forest timber, the National Forest range is already in practically full demand. When the Forests were created abuse of the range had gone much further than abuse of the timber. Because of the extent to which deterioration had taken place, because there was immediate demand for most of the forage, and because the forage crop is produced and harvested each year, opportunity for realizing immediate results through constructive administration was greater in the case of range management than in that of forest management. The objects sought were (1) the protection and conservative use of the range itself; (2) promotion of the best permanent welfare of the live-stock industry; and (3) protection of the settler and home builder against unfair competition in use of the range. The results which have been already obtained are a striking example of what practical conservation means. The work of the year in range management will be set forth later. I wish now, however, to call attention to the fact that all of this work has been accomplished through technical administration and could not have been accomplished without it. The technical knowledge required to handle grazing questions satisfactorily has been developed along with that required for timberland management and is applied by the same technical staff. To a large extent the two sets of problems interlock and must be handled together.

In developing technical methods of administering the Forests material assistance has been obtained by drawing on the expert knowledge possessed by various branches of the department besides the Forest Service. The Biological Survey is aiding greatly in the work of reforestation by devising methods for the control of rodents, which interfere formidably with the success of reforestation through seed sowing; is assisting in improvement of the range by the elimination of prairie dogs, which cause a heavy annual loss in the forage crop; and has contributed to the work of lessening losses to live

stock through predatory animals. Protection of the Forests against destruction by insect infestations and tree diseases is in the long run fully as important a technical problem as that of protecting them against destruction by fire. In attacking it the Bureaus of Entomology and Plant Industry are contributing to the administrative work on the Forests. The Bureau of Plant Industry has also done very valuable work through studies conducted by its specialists in order to learn how the forage crop may be increased through natural revegetation of areas depleted by overgrazing and through artificial reseeding, how losses of stock from poisonous plants may be lessened, and how the carrying power of the range and the condition of the stock grazed may be improved through modifications of the methods of handling the stock. The Bureau of Animal Industry also has, in cooperation with the Forest Service, materially assisted the work of range management by checking the spread of contagious stock diseases.

FIRE PROTECTION.

In my report of last year I gave an account of the disastrous fires which took place in the summer and early fall of 1910, and discussed the means of fire protection. The final figures of losses and total area burned do not vary materially from the provisional estimates which I then gave. The fires of the calendar year 1910 covered more than 3,000,000 acres of Government timberland and 800,000 acres of private timberland within the National Forest boundaries, and inflicted damages to National Forest timber, including young growth, estimated at a little less than \$25,000,000. The loss in timber destroyed or damaged was slightly over 6,500,000,000 board feet. In a single season the losses exceeded the total of all former years since Government protection of the Forests began. Compared with the calendar year 1909, the estimated money loss in 1910 was in the ratio of more than 50 to 1. In fighting the fires special expenditures were incurred totaling over \$1,000,000, besides the cost in time of the regular protective force.

I pointed out a year ago that these extraordinary losses were due to unprecedentedly unfavorable weather conditions, and were, considering all the circumstances, unpreventable; but I also pointed out that they were not beyond the possibility of prevention, given the time and the means for building up a thoroughly organized protective system. Even the terrific fires of 1910 would, beyond any question at all, have inflicted enormously greater losses upon private as well as public property, and very likely much heavier losses of life, had it not been for the protective work of the Forest Service. The experience of the season of 1911 has shown that the fires of 1910 were not without their benefits. They furnished an invaluable test,

under an ordeal of the utmost severity, of fire-fighting methods and needs, and also stimulated the men of the Forest Service to strain every effort in a determined attempt to prepare for the occurrence of similar conditions. By nearly doubling the appropriation for permanent improvements, Congress made available funds which were greatly needed for extending and supplementing the trail and telephone systems and for equipping lookout stations. Plans framed with a view to meeting all possible contingencies, and for coordinating all activities on the Forests in connection with the fire-protection plans, were worked out in detail during the winter. At the opening of the new fire season a notable advance had been made in the development of a more highly organized and, for the means available, efficient protective system.

The results which have been obtained are a striking evidence of the value of the preparations made. Final figures can not yet be given, but it is certain that a record has been established that surpasses anything previously achieved. While in most National Forest regions relatively favorable weather conditions prevailed, in Washington and Oregon the season was even worse than that of 1910; but the careful preparation, in the light of previous experience, made it possible both to discover fires in their incipency and to concentrate quickly upon them a capable fire-fighting force. When the regular Forest force was insufficient to handle fires, arrangements made beforehand with settlers, lumber companies, mine operators, construction parties, and others enabled picked men to be quickly summoned. Plans for provisioning and equipping with tools fire-fighting forces and for transporting supplies and equipments from available bases to the men on the fire line were carefully worked out. In short, the object aimed at was that nothing should be left to chance or extemporized effort in the face of an emergency. The localities exposed to greatest danger, either because of the existence of conditions creating a special risk of the outbreak of fires or because the damage, should they gain headway, would be particularly severe, had been ascertained and received special protection. Patrol of the Forests was organized and distributed with a view to obtaining the largest possible efficiency, and the construction of telephone lines and trails was pushed where they were most needed. Lookout points and watch towers, connected by telephone with the headquarters of each Forest, were located in commanding positions and proved of invaluable assistance in the prompt discovery, precise location, and swift reaching of fires. As a result of these careful preparations the fire damage was greatly reduced. The fund of \$1,000,000 made available by Congress in case of extraordinary emergency was drawn upon only to the extent of a few thousand dollars. In district 4 the total extra charges incurred for fighting fires amounted to less

than \$3,200; in 1911 the corresponding cost was \$56,000. On the only Forest in this district for which figures of loss this year have reached me, 42 fires have occasioned an estimated loss of \$30, where in 1910, 17 fires occasioned a loss estimated at \$151,500.

While the results of the past summer are gratifying, it must not be assumed that the protective organization is yet able to cope successfully with a repetition of the climatic conditions which occurred in 1910. The inadequacy of the system of communication is its greatest weakness. There have been completed on the National Forests the equivalent of 1.29 miles of trail and 1.04 miles of telephone line to each township of 36 square miles. This means that if all the trails were laid off on straight lines running parallel to each other, without detours or cross connections, they would still be about 28 miles apart, while the telephone lines if similarly located would be 35 miles apart. Of course the system of communications built by the Forest Service is supplemented by roads, trails, and telephone lines which are the result of community and private enterprise; but the fact remains that great parts of the National Forests are most indifferently provided with improvements. Ten miles of trail and six of telephone line in the average township represent the approximate system needed for efficient protection. The construction of about eight times the present mileage of telephone line is therefore necessary to safeguard the National Forests adequately.

A remarkable development of public sentiment regarding forest fires has taken place. In this field, also, the fires of 1910 proved a great lesson. Belief on the part of a portion of the public that forest fires are either inevitable or of little importance has been replaced by a keen realization of the necessity for adopting safeguards against them and for putting them out. One result of this awakened and healthy sentiment has been more exacting demand for a high standard of protection of the National Forests. Fires which would previously have attracted little or no attention now receive wide newspaper notice and comment. The gain along this line has been enormous. It means, of course, public criticism if fires are not effectively controlled; nor is this a misfortune, for a public demand that a high standard of administration shall be maintained is in itself a safeguard; but it means also diminution of carelessness, better laws, and more general efforts to combat forest fires everywhere.

The growth of sentiment is reflected in the increased desire on the part of timberland owners, railroads, and business enterprises of all kinds conducting operations on or near the Forests to cooperate with the Forest Service in fire protection. The efforts of the railroads which run through the Forests to reduce to a minimum the danger of fires along their lines, through clearing their rights of way, preventing the discharge of sparks and the dropping of live coals, and

cooperation in patrol of the lines and the reporting of all fires discovered, deserve special mention, and the same is true of the increasing desire of timberland owners to provide systematic protection of their extensive holdings. Where these holdings are either adjacent to or intermingled with National Forest land in such a way as to make a common system of protection advantageous to both parties, the Forest Service and the associations have joined forces.

FOREST MANAGEMENT.

There was cut on the National Forests during the year a total of almost 500,000,000 board feet of timber, of which about 375,000,000 feet was sold and over 123,000,000 feet cut under free use. The total value of the timber cut under sales was \$843,000, a decrease of \$63,000 from the previous year. The contracts of sale entered into during the year, however, disposed of over \$2,000,000 worth of timber—an increase of 50 per cent over the corresponding amount for the previous year. The average stumpage price obtained for the timber sold was \$2.56, as against \$2.44 in 1910.

It is estimated that the annual cut which might be obtained from the National Forests without diminishing the available supply (since the increase by growth would offset it) is over 3,250,000,000 feet, or more than six times what was cut. The Forests are now a heavy charge on the Government, and much of the timber is overmature. A natural question is: Why are not the sales increased, at least to the point at which the Forests will pay their way?

The answer is readily given. Since the panic of 1907 the lumber market has been depressed. During the past year there has been overproduction in the Northwest, where the heaviest stands of National Forest timber are found. To obtain any great increase in the receipts from timber sales last year I should have had to offer the timber at a price far below its actual value. The public is now amply supplied. Within a relatively few years the timber on the National Forests will be in great demand to meet fast-growing necessities and to help develop the West. I should be utterly disregardful of my responsibility and duty to the public, which owns the timber, if I were to permit large amounts to be needlessly sold on bargain-day terms, and with the knowledge that instead of promoting the conservation of our timber resources I am accelerating their waste.

Vigorous efforts to dispose of at least a considerable fraction of the timber killed in last year's fires culminated after the close of the fiscal year in several large sales, aggregating about 290,000,000 feet. It is hoped to be able to sell perhaps 1,000,000,000 of the estimated 6,000,000,000 feet of dead timber which formed the aftermath of these fires; the remainder is too remote from present demands to

be lumbered. The effort to sell this timber did not consist merely in making known the fact that it was for sale and offering it at a low price. Almost before the fires had ceased to smoke preparations had begun for cruising the timber in order that full data might be available for prospective purchasers. By being able to tell interested lumbermen what quantities of timber were obtainable on specific logging units, what development of transportation facilities would be required, and what logging methods could be employed, sales were facilitated. The same method is being extensively practiced for sales of live timber. Reconnaissance parties are put in the field to secure detailed timber estimates and make accurate maps, thus obtaining data valuable both for devising a long-term plan of management and for making immediate sales; intensive reconnaissance studies have now covered nearly 9,000,000 acres, of which nearly 4,000,000 acres were covered last year. Less intensive reconnaissance has covered an additional 17,000,000 acres.

On the basis of the best information in hand, I fix each year a maximum cut to be allowed during the year, usually for each Forest, but sometimes for groups of Forests so situated that from the standpoint of sustained yield they may be treated as a single unit without jeopardizing the future supply of timber for local use. This maximum cut is prescribed in order to prevent overcutting—that is, the removal of more timber than the current production through growth. The maximum cut authorized from all Forests during 1911 was a little less than 3,300,000,000 board feet. All sales are made with primary consideration for developing the productive power of the Forests through utilizing material whose removal will either be followed by the establishment of a new crop or increase the growth of the part of the stand left or both together. Merchantable dead timber and overripe timber, which is declining in quantity and value through decay, are being disposed of wherever a market is open. Under the silvicultural methods which are being applied steady increase in the rate of annual growth will be secured for many years.

Out of a total of 5,653 separate sales made during the year, 5,144 were for less than \$100 worth of timber each, 397 for from \$100 to \$1,000 worth, and only 39 for over \$5,000 worth. These figures show the extent to which the National Forests are drawn upon for the supply of small local demands. It is evident, however, that, along with continued use of the Forests for meeting local needs through small sales, a wise public policy demands the making of sales to large purchasers who will operate through a term of years, in Forests too far removed from present markets to permit of utilization in the near future without heavy investments of capital for means of transportation to get the timber out. Prior to the year 1911 no contracts

were made for operations to cover a longer period than five years. Last year, however, three sales were advertised on terms which contemplated operations extending over from 7 to 10 years. It will be my policy, as favorable opportunity offers, to sell a certain amount of timber under longer-term contracts than have prevailed in the past, but with provision for the readjustment of stumpage prices at regular intervals and with proper precautions against purchases made with a view to reaping a speculative profit. Such sales will not only make it possible to utilize timber now ripe for the ax and thereby to increase the productivity of the Forests, but will also make it possible to advance with fair rapidity toward the point at which a sufficient income will be obtained to make the Forests self-supporting. The marked increase in the volume of sales last year, previously noted, is an indication of progress already making in this direction. On a number of Forests on which demand for timber is active the receipts from timber sales show even at the present time a net revenue over the cost of administration.

REFORESTATION.

The problem of reforestation concerns both the establishment of new growth after lumbering operations and the extension of the forest over denuded areas. In either case there is a choice of methods. Reforestation may be accomplished, and is actually being accomplished on a very large scale, by making the forests themselves do the work. It is also accomplished through artificial methods.

The most valuable tool, under present conditions, for renewing and extending forest growth is fire protection. There are about 15,000,000 acres of denuded lands within the National Forests, the result of old fires and unregulated grazing. To a large extent these areas are now practically unproductive barrens, though some of them have a certain value as inferior grazing lands. In addition, some 90,000 acres are cut over annually under National Forest timber sales; and there is a further area, large in the aggregate, of grass lands, much of which will eventually be covered with growing timber. On all of the land which is now being cut over the operations are planned with a view to securing natural reforestation. It is estimated that an additional 150,000 acres of denuded land are being reoccupied by forest growth through natural extension. In both cases the desired results depend absolutely on keeping out fires, supplemented on a large part of the areas involved by the control of grazing. In other words, over 250,000 acres are being reforested annually by creating conditions favorable to natural reproduction.

It is probable that half the denuded lands, amounting to about 7,500,000 acres, will eventually be reconquered by the forest with-

out the employment of other agencies than the control of fires and the regulation of use. At the estimated present rate of forest extension it will take about 50 years to complete the process. Artificial reforestation must be employed on the other half, and will doubtless also be employed to some extent, as the need for timber supplies grows more pressing, to hasten the process of natural forest extension. It may also be called for as the best means of reestablishing the forest after lumbering on certain classes of cut-over lands.

The object sought in reforestation is not only the production of timber for cutting, but also the improvement of stream-flow conditions.

The work of the year in artificial reforestation included both seed sowing and tree planting. The seed sowing was applied on a little more than 23,000 acres under a variety of methods. The tree planting was applied on 2,000 acres with the use of nursery stock grown in nurseries on the National Forests. Aside from the stock furnished without charge to settlers in western Nebraska under the Kincaid Act, the annual product of these nurseries will within three years be sufficient, after providing for losses incident to the various stages in the development of hardy seedlings, to plant 8,000 acres annually.

On most of the National Forest areas which are in the greatest need of artificial reforestation the work is exceptionally difficult. Where the natural conditions are favorable, the Forests tend to restore themselves. Success in establishing a new forest growth under semiarid conditions depends on the discovery of methods based on careful experiment, and even so must always involve a certain element of luck, due to the vicissitudes of seasonal variations. In a certain sense, almost all of the work hitherto done is to be regarded as experimental; that is, it is the process of working out commercial methods rather than the application of methods which have been reduced to a strictly business basis. The practical expediency of reforesting any area as a wise business policy could be decided only by balancing the probable cost against the probable benefits; this would require a reasonably accurate estimate of the cost. The object of the work which has been actually undertaken has been rather to find out what the cost will be and to test the relative cost and success of different methods. Considered as a business operation, the average cost has been high and the variation in cost has been extreme. The practical value of the work lies in this very fact, for results are being secured in the light of which future operations may be directed along the best and most economical lines.

In regions where the conditions are relatively favorable, as on the west slopes of the Rocky Mountain and Cascade Ranges in the Northwest, the results obtained justify operations upon a larger

scale than in the past, although there is still need for intensive work with investigation as its prime purpose. From the standpoint of obtaining a maximum return from the expenditure involved much further study is needed. Nevertheless, the knowledge already obtained justifies making a considerable start upon the actual work of reforesting portions of the great area of denuded lands. As sufficiently conclusive experimental results are secured the work will be extended into new regions.

One field in particular calls for early action. The watersheds of certain streams used for municipal supplies or for irrigation are in urgent need of improvement by the establishing of a forest cover at the earliest possible time. While it would be improper to expend large sums in attempting reforestation, even on such watersheds, before methods known to be successful have been worked out, immediate attention can be given to the betterment of a number of important municipal and irrigation water supplies. This work has already been entered upon.

The cost of the seed, nursery stock, equipment, and labor required to reforest the 25,000 acres covered last year was about \$134,000. The Forest Service is now prepared to reforest 30,000 acres annually, without asking any increase of its total appropriation. To divert from other lines, which are essential for proper protection of the Forests, and for enabling the public to use them, funds which would provide for a greater extension of the work of reforestation would, in my judgment, not be justifiable under present conditions.

Certain important facts have been discovered concerning the relative merits of different methods. The success of direct seeding in all regions in which the supply of soil moisture is not fairly good must be regarded as at the best problematic, but reasonably good results have been obtained in planting nursery stock in some of the drier regions. The use of European seed appears inadvisable, though it can be bought at a lower cost than that involved in collecting western seed. About 53,000 pounds of coniferous seed was collected by the Forest Service, at an average cost of \$1.24 per pound, while about 27,000 pounds was bought at an average cost of 78 cents per pound. Devices have been developed for extracting and cleaning seed by machinery at extracting plants located at central points, to which the cones can be sent. The cost of collecting seed has been found to vary widely, depending principally upon the abundance of the seed crop, and it will be the policy in future to gather large quantities of seed in years when the crop is abundant, spending much of the money available for reforestation in such years in obtaining seed for use in following years. As a result of the study of the effects of storage it is now certain that seed can be carried over from one season to another with slight loss of fertility. The problem of

preventing the failure of seeding operations through the work of rodents, studied with the aid of the Bureau of Biological Survey, gives promise of successful solution. Broadcast seeding on unprepared ground, though altogether the cheapest method from the standpoint of labor cost, has been found to be in the long run the most expensive and the least satisfactory method, both because of the relatively large amount of seed required and because the seed seldom finds the conditions required for germination and the establishment of the young plant. As a rule sowing in the fall has been found better than winter or spring sowing, since it secures earlier and, with many species, much more uniform and complete germination. In some localities, however, the contrary is true. The average cost of seeding in the larger administrative units varied from \$2.35 to \$6.95 per acre. Marked progress was made in reducing the cost of nursery-grown stock, and it is believed that 2-year-old seedlings can soon be produced for not over \$1 per thousand plants and 2-year-old transplants for not over \$2 per thousand. One-year-old seedlings were grown in Washington at 37½ cents per thousand, exclusive of the cost of equipment, but a large part of the stock used in planting during the year cost from \$8 to \$12 per thousand. The experimental work was exceedingly varied, including many kinds of hardwoods and the widest range of localities, conditions, and methods.

GRAZING ON THE NATIONAL FORESTS.

Both the number of animals grazed on the National Forests and the receipts from grazing were less in the fiscal year 1911 than in 1910; the paid grazing permits issued covered about 1,352,000 cattle, 92,000 horses, 4,500 hogs, 7,372,000 sheep, and 78,000 goats. The amount received from grazing was \$935,490.38, which is \$51,419 less than last year.

The falling off in the total number of stock grazed was due not only to the reduction in the amount of the range available through eliminations of land from the Forests, but also to general conditions affecting the stock industry. The grazing season of the calendar year 1910 was one of abnormal scarcity of feed and water because of the prolonged drought. The forage crop was estimated at from 25 to 33 per cent below normal, and matured very early. Nevertheless, the stock grazed on the National Forests passed through the season without severe losses and left the Forest ranges in better condition than had generally been expected. High market prices for cattle, however, combined with scarcity of feed on the winter ranges and of hay, together with the belief among sheep owners that the immediate outlook for their industry was not favorable, caused large reductions in the number of stock carried through the winter. In consequence

the demand for range for the season of 1911 was decidedly less than the year previously.

The capacity of the range for the grazing season of 1911 was, except for the effect of the eliminations made from the Forests, above that of previous years. Favorable weather conditions resulted in an exceptionally heavy production of forage. The two unfavorable preceding years had put the range to a severe test, but the effects of the regulation of grazing in order to prevent impairment of productive power, and of the development work which has increased the area of available range and the supplies of water for stock, had borne good fruit. On seven Forests considerable reductions in the number of stock which it was considered advisable to admit had been decided upon; but the increases made on other Forests more than offset these reductions, so that had it not been for the decreased demand for the grazing privilege due to general conditions affecting the stock industry, and the elimination of large areas having a high grazing value, the grazing use of the Forests during the year would have exceeded that of 1910.

It is also to be noted that, both in the case of cattle and horses and in that of sheep and goats, the number of permits issued to small owners was greater than in 1910. The total number of permits issued in 1911 was 25,604, as against 25,687 in 1910; but the number of cattle and horse permits for less than 40 head, and the number of sheep and goat permits for less than 2,500 head, showed an increase.

There has been a tendency on the part of some of the associations of stockmen formed to cooperate with the Forest Service in the adjustment of use of the range to become disorganized because the immediate grazing problems have been worked out to so satisfactory a conclusion that there seems little to hold the associations together. While it is a cause for gratification that the relations of the Forest Service with the stockmen have become so satisfactory, the opportunities for helpfulness to the stock industry in developing better methods of range utilization are such that continued cooperative work is highly desirable, and it is to be hoped that the associations of stockmen will be maintained to further this work. The number of associations now cooperating with the Forest Service is 68.

As a result of the work of the Bureau of Animal Industry in cooperation with the Forest Service, all but three of the National Forests are free from communicable diseases of live stock. Protective measures were necessary to prevent the spread of scabies, lip-and-leg disease, and Texas fever. About 8,000 predatory animals were destroyed by employees of the Forest Service during the year. The number of most kinds of animals killed was less than in 1910, indicating that the work of past years has had its effect in reducing the number of animals which infest the National Forest and adjacent

ranges; of grown wolves, however, there were killed 25 per cent more than in 1910. The work of freeing the ranges from prairie dogs was carried on by the Forest Service for a part of the year and then taken over by the Biological Survey; on the areas which have been treated the infestation has been greatly reduced. The losses of live stock from poisonous plants were reduced to a negligible point. The Bureau of Plant Industry rendered indispensable assistance in this work, as also in the study of the very important technical questions involved in the effort to improve the condition of depleted portions of the range.

A work of great importance to the development of use of the range to its highest point was inaugurated in the form of plans for technical reconnaissance on all the National Forests suitable for grazing use, with the object of gathering exact data on all matters which affect range management and the production of the forage crop. This work will ascertain the character of all land within the Forests, the kind of stock to which each natural grazing unit is best adapted, the natural periods of use, the undergrazed, fully grazed, and overgrazed ranges, and localities in which poisonous plants and range-destroying rodents are found.

Striking results were obtained in an experimental test of a system of inclosures for lambing pastures, designed to decrease losses and lessen injury to the range, and in continuation of the coyote-proof pasture experiment.

APPALACHIAN WORK.

The act of March 1, 1911, commonly known as the Weeks Act, made available for examining and purchasing forest lands in the White Mountains and Southern Appalachians before the close of the fiscal year 1911 the sum of \$2,000,000. By the provisions of this act I was authorized and directed to examine, locate, and recommend for purchase lands in my judgment necessary to the regulation of navigable streams. Approval of all purchases was vested in a commission of seven, created by the act; but purchases were to be made only after field examinations by the Geological Survey had established that control of the lands would promote or protect the navigation of streams. It was provided that I should serve upon the commission, and should purchase, in the name of the United States, lands which the commission had passed upon favorably.

Immediately upon the passage of the act I instructed the Forester to organize and press forward the work of land examination. Field information previously gathered made it possible to select at once a number of specific areas within which the purchase of lands was desirable. Proposals for the sale of lands within these areas were invited on March 27. At the close of the fiscal year, on June 30, pro-

posals covering over 1,250,000 acres had been received, over 170,000 acres had been examined, and the purchase of 31,377 acres had been authorized. The fiscal year 1912 opened with 35 examiners at work, and with every indication that during the year land enough will have been covered to afford a basis for recommendations of purchase up to the limit of the \$2,000,000 appropriation made available by the law.

INVESTIGATIONS.

Much of the investigative work of the Forest Service has already been touched upon in describing the administrative work, particularly as regards the study of problems which relate to forest management (including reforestation) and range management on the National Forests. The timber and range reconnoissances which are being carried forward on an extensive scale are investigations to obtain data indispensable for the intelligent utilization and conservation of the productive power of the Forests. Besides the studies of methods of direct seeding, nursery practice, and field planting, which have formed a large part of the reforestation work, the subjects of seed production, seed fertility, methods of storage, and heredity of desirable and undesirable qualities have been under investigation, as well as that of the effect upon reproduction of different methods of disposing of slash, and of different methods of grazing control. At the three forest experiment stations which have been established in Colorado and Arizona, careful studies of forest influences, including the effects of forests upon stream flow, and of climatic requirements of different forest types have been conducted. Research work in forestry is just as essential to securing the best use of our forest lands as is research work in other branches of scientific agriculture to the best use of our farm lands. Unless this work is prosecuted vigorously and along many lines, progress in developing better methods of handling the Forests will be severely handicapped. It has been necessary, however, to reduce the investigative work to a minimum during the year in order to provide for the immediately pressing necessities of protection and use. The present appropriation compels curtailment of activities along all other lines in the effort to keep fires down and transact current business. That is, to a certain extent, a sacrifice of future to present welfare is a fact which must be frankly recognized.

Forest investigations are also conducted in the interest of improved use of the forest resources of the country which are in private ownership and to aid the various States in inaugurating and developing wise forest policies. Forest studies conducted with these ends in view were continued in all parts of the country. Effort was especially directed toward the promotion of practical forestry among

farmers, who own in the aggregate so considerable a part of our timber-growing land. From the fact that the farmer's woodlot constitutes a permanent holding, drawn upon steadily for wood supplies, the practice of forestry can probably be more easily introduced on the woodlot than on the large holdings of lumbermen, whose operations are seldom planned with a view to holding the land permanently for forest purposes.

A very important part of the investigative work is that which relates to the study of forest products. The major part of this work is conducted in the Forest Products Laboratory at Madison, Wis. It includes studies in the physical properties of wood, the drying of wood, strength tests, wood preservation, wood distillation, the production of wood pulp and paper and of naval stores, and wood utilization. Many of these studies are highly technical, but all are thoroughly practical in their aim. The facilities for scientific research in the field of forest products are now adequate, and the work is well organized and conducted by a corps of trained specialists. Results are being attained which mean a lessened drain upon our forest supplies through more economical use of material, the opening of new sources of supply for various industries, the utilization of every kind of wood for the purpose to which its intrinsic qualities best adapt it, a greater incentive to the practice of forestry because of the increased returns made possible, better adjustment of wood-using industries to meet the conditions created by past use without forethought, and a general clarifying of the situation with respect to our forest resources and requirements through accurate knowledge of what these requirements are and what is available to fill them.

BUREAU OF SOILS.

SOIL SURVEY.

Soil surveys were carried on in 60 areas distributed through 21 States, and a total area of 95,420 square miles was mapped. Of this area, 25,096 square miles were mapped in detail and 70,324 square miles were mapped in the broader, more general way, which we designate as reconnoissance mapping.

The demand for surveys continues to run far ahead of our ability to do the work. An increasing interest in the work is being manifested by agricultural colleges and experiment stations. They are beginning to use the results of the work as a basis for their experiments as well as their demonstration and extension work. The lack of such a demand in the past has been due to a recognition of the futility of the demand if it were made. Soil surveys had not, until very recently, covered an area in any State sufficiently large to enable investigators to draw any general conclusions from them or to base

on them any comprehensive scheme of investigations. This is no longer the case. In a few States as much as half the area has been mapped, and in many others from a fourth to a third has been covered. Owing to the policy of the survey of distributing the work rather uniformly over the whole area of the various States, even the mapping of a fourth of the total area will enable an investigator or a student of the maps to arrive at a close approximation to the distribution over the State of the main soil areas, such as the soil series, at least.

Until considerable areas had been covered wholly or in such a way that approximate conclusions could be drawn as to the conditions in such areas, our results could not come into general use. Not only could they not be used for the reasons stated above, but they were not even well known; not enough had been done to attract attention. A certain amount of passive or active opposition, due in many cases merely to lack of familiarity with such work, its methods, nomenclature, and results, manifested itself during the early years of the bureau's activity. The time has come when the work is forcing its way to recognition by its quantity, even if it be not by its quality. The mere mass of the work already accomplished is making it evident that it has already gone so far that to recede is impossible. It is evident also that the general plan of the work can not be profoundly changed, thereby causing those whose objections to the work were based on its methods and its system of expressing its results to realize that such objections must now be futile. There is no such thing as an absolutely right way to do work of this character. There are various methods and various points of view. One method or system must be adopted and one point of view must be maintained if the results are to have any consistency or any value. It is not so important which system is adopted or what point of view is maintained as it is to be consistent after some one system has been adopted.

The work of the soil survey is no longer new and unfamiliar. Because of increasing familiarity with it investigators find less occasion to criticize it or ignore it. By many, if not most, of the broadest men in the agricultural colleges and experiment stations of the country the necessity of a soil survey on which to base investigations is admitted without question. That the idea will spread still further can no longer admit of a doubt.

This increasing recognition and interest in soil survey work is expressing itself in increasing requests for cooperation, made by State organizations. We have been compelled to decline many such requests solely because of lack of funds. Cooperation with a State organization makes it necessary for us to do more work and spend, therefore, more money in that State than might be done without cooperation.

In declining requests for cooperation, however, we have not changed our opinion as to the value of cooperative work. Work done under such conditions is considered to be often of a higher grade than that done without cooperation. It brings together and harmonizes the experience of two organizations, each, because of the conditions of its existence, possessing knowledge that the other does not possess. It increases also the total amount of work done by the amount that the State men are able to do. It is very desirable that the Bureau of Soils be placed in a condition enabling it to take up cooperative work with all the States that desire it. This will avoid the inevitable confusion that would result if the States should do the work alone and according to any point of view they might have. The increasing interest in the work is making it certain that the States will undertake it alone if the bureau can not lend its aid in the matter. For the sake of fullness, accuracy, and uniformity of results it is very important that the bureau should be placed in a position where it would not be compelled to decline requests for cooperation.

Another condition arising from the increased interest and recognition of the work of the soil survey is the necessity for greater accuracy, not only of mapping, but of definition and correlation. This necessitates more careful supervision of the field work, more comprehensive study of soil relations, and more careful criticism of reports and maps by the scientific staff of the survey. During the past year more time has been spent in this part of the work than has ever been spent in this way before. The results have fully justified the money and effort expended. Rigid supervision is absolutely necessary if uniformity of results is to be attained. The increased supervision has not, however, sensibly increased the cost, per square mile, of the work. The membership of the supervising staff has not been increased, in fact there has been a slight decrease, but the better results are being brought about by greater care in the work and better methods. Revolutionary or striking results have not been attained and are not expected in the future. Soil survey work is fundamental in its nature. In the very nature of the case it can not be spectacular. The soil survey is an institution devoted to the accumulation of a well-defined group of facts. The knowledge thus gained has a scientific as well as a practical value. The practical knowledge can be applied in many cases at once and valuable economic and social results arise from it. This is the value that is usually emphasized—to be able to direct agricultural progress along proper lines, to point out natural adaptabilities of soil, to suggest improved methods of cultivation based on a knowledge of the soil to be cultivated, merely to attract the cultivator's attention to the soil as something well worth his careful study; these are some of the possibilities and actualities of the soil survey. The fact, however, that its results have a practical value of this kind makes them no less valuable as facts of science.

A careful survey of the natural resources of a state or a nation is essential to the inauguration of a systematic plan for utilizing or developing them. This has long been recognized in theory, but has been strangely limited in its application. Geological surveys were inaugurated by many States more than half a century ago and by the Nation many years ago. Forest surveys also were begun in a very general way by some of the States many years ago. A survey of the soils of any part of the country, however, seems not to have been seriously thought of until little more than a decade ago, yet the natural resources of the soil are of more importance to the welfare of mankind than all other natural resources combined.

SOIL-FERTILITY INVESTIGATIONS.

The work on the problems connected with the fertility of soils has opened up avenues of profitable investigation and already forecasted results of great economic importance. The investigations have been made on soil from various parts of the United States, comprising a number of important soil problems. During the year these researches have led to the discovery of organic soil constituents decidedly beneficial to growing crops. These are organic nitrogen compounds, and it has been demonstrated that they exist in organic fertilizers, in green manures, and in soils; that they are directly beneficial to crops, and that they are able to replace nitrates in aiding plant growth. The facts demonstrated by these investigations are of fundamental significance in soil fertility, and the recognition of these directly beneficial soil constituents is no less important than the recognition that harmful soil constituents exist.

The effect of harmful soil constituents and their distribution in the soils of the United States has been further investigated. The presence of one of these harmful constituents has been definitely associated with poor yield on many soils from all parts of the United States from Maine to Texas and Oregon. The compound is therefore of common occurrence and is likely to be encountered in soils where unfavorable conditions exist which tend to form and accumulate this constituent.

The nature of soil humus has been further investigated and a considerable number of new constituents determined, among them organic compounds containing nitrogen and phosphorus. The nitrogen and phosphorus are frequently tied up in the soil in very resistant forms in complex compounds which have been isolated. To be utilizable by plants this complex must be broken up, and this phase of the question has already been studied with considerable success. The chief aim in the agricultural use of nitrogen is to convert this into nitrates by chemical and biological means, an operation which is far from simple. The present researches are very suggestive of

the fact that for agricultural purposes it may not be necessary to convert all nitrogen into nitrates, but that nitrogen of waste nitrogenous materials in the industries can be converted into compounds of the nature of the beneficial soil constituents discovered in this work, and so make available to agriculture much nitrogen now lost because of the difficulty of converting it into nitrates.

FERTILIZER RESOURCES.

The management of the soil for the efficient and economic production of crops is the fundamental problem of agriculture. In general, three instrumentalities are available, namely, tillage, crop rotation, and fertilizers. And the history of the world shows that as the civilization of a region advances intensive methods of cultivation replace the extensive methods of the pioneer, and all three instrumentalities must be employed that the land may be brought to and maintained at a high productivity.

Tillage and crop rotation problems are very largely within the personal control of the farmer himself. Fertilizers, however, involve contact with outside commercial and manufacturing interests, so that they invite the special aid of the Government. Two great problems are presented, (1) to find sources of fertilizer materials, and point out methods and agencies for the preparation of the material to the use of the farmer, and (2) to bring the people to a realization of the value of properly used fertilizers. To both of these problems this department is addressing itself assiduously. To further the efforts of the department, especially in meeting the demands of the first problem, Congress at its last regular session made a special appropriation, directing that the Bureau of Soils should explore and investigate natural sources of fertilizer materials. Although less than half the fiscal year has expired since this appropriation became available, the results accomplished are of a character to justify special comment at this time.

Phosphatic fertilizers have been studied, the areas of productive rock at present and prospectively available have been noted, and valuable information has been gathered regarding improvements in methods of saving waste at the mine and in the manufacture and distribution or sale of product. It seems that new occurrences of natural deposits of phosphates are being continually reported and that the amount of such material now known to exist in this country is so vast as to dissipate any fears as to our natural resources in this regard. At the same time, for many reasons, improvements in methods of mining and utilizing this great resource are imperatively demanded in the people's interest, and we have called attention to these matters in appropriate publications from this department.

Among the various sources of nitrogen fertilizers, possible deposits of nitrates in the arid and semiarid areas of the country have long held a prominent place in the scientific and popular mind. Our people have observed and studied some deposits of this character. Generally, however, these deposits are either too small in amount to justify commercial exploitation or they are inaccessible to transportation or available water for working them, or are otherwise of doubtful economic importance. There is no available experience in this country to guide our people in working such deposits, the conditions surrounding them being essentially different from those in other countries.

Whether or not natural deposits of nitrates can be commercially exploited is yet an open question, but it is a distinct advance to know that such deposits exist. Various other sources of nitrogenous fertilizers have also been investigated, and it is especially worth noting that there is a well-defined tendency in our main coking regions to introduce modern ovens and make available large quantities of ammonia, which have generally been discarded until very recently.

Especial interest attaches to the work on potash fertilizers, because commercial sources of potash have been unknown in this country, the world's supply in fact coming from the Stassfurt deposits in Germany. The advantage of having a domestic source is so obvious as to require no comment. Possible sources of potash are by no means few. Much potash can be recovered from the immense accumulations of sawdust in our lumbering regions, from the vinasses in our sugar mills, from wool washings, etc. Possible sources of potash include also the bitterns or mother liquors from our salt workings. These are now under investigation. Segregated deposits of potash salts may lie under our known salt deposits, or below the present surface in desiccated sea or lake beds. This is now being investigated. The desert basins are being explored by our agents for surface deposits of potash, as well as nitrates.

The utilization of natural potash-bearing silicates has long attracted investigators and inventors. Vast deposits of potash feldspars, glauconite, leucite, and other suitable minerals exist in this country, and our laboratories as well as private parties are now actively at work on methods for extracting the potash. The extraction of potash in various ways is perfectly feasible in the laboratory. But the energy required to break down the chemical combinations and extract the potassium is so large as to make its production inhibitive at the present time. Extremely cheap power or the incidental production of valuable by-products might possibly make the potash silicates commercially available.

There is, however, one mineral which occurs in large quantities and which offers some hope of becoming a commercial source of potash. This is the basic alumino-potassic sulphate known as alunite. From it potash alum (known commercially as Roman alum) has long been made in Europe. Our people have shown that potash can be readily obtained from the mineral, and, by special devices which they are studying, probably other by-products can be obtained which will greatly cheapen the cost of the potash.

The most promising source of potash at present is found in the large areas of kelp groves or sea algae lying along the Pacific coast, growing wherever there is a rocky bottom and a rapid tideway, or beyond the surf line, at depths of from 6 to 10 fathoms. These groves are of various areas from beds of a fraction of an acre to stretches 5 miles in length and 2 or more miles in width. During the past summer our people have mapped about 100 square miles of kelp groves in different localities from Puget Sound to Point Loma and have studied the character of the algae as well as the conditions necessary to their utilization commercially and to their maintenance as a permanent resource of the country. Many more areas yet remain to be studied and mapped, but from what has been accomplished in this preliminary work I am assured that a conservative estimate shows that the kelp which could be gathered from the 100 square miles already surveyed, and without detriment to the permanence of the groves, should yield 1,000,000 tons of chloride of potash annually, worth at least \$35,000,000, or about thrice the value of the present importations of potash salts from Germany.

Satisfactory methods of gathering the kelp are yet to be worked out, but present only minor mechanical difficulties. The value of the kelp is, moreover, probably much greater than represented by the content of potash alone. Our laboratories have shown that iodine and other useful products can be obtained which will pay in large measure, if not fully, for the cost of gathering the kelp and abstracting the potash salts.

Enough has been accomplished to show that this country has within its own borders resources to meet the fertilizer requirements of the present, and for a greatly increased use in the coming years. The saving to our people which can reasonably be expected from these investigations is enormously greater than the cost. These investigations are, however, but little more than begun, although begun very well. That they should be liberally supported and actively prosecuted can admit of no possible argument. Economic independence of outside nations with large financial gain to the public at the same time is a desideratum justifying the utmost effort of our scientific investigators and strong sympathy and aid from the people's representatives.

BUREAU OF ENTOMOLOGY.

The work of the Bureau of Entomology covers the whole field of the economic aspect of the work of insects, whether they are injurious to agriculture or horticulture or to domestic animals or man, or whether they are beneficial in one way or another. Only a few of the numerous investigations carried on under this bureau can be mentioned here.

WORK ON THE GIPSY MOTH AND THE BROWN-TAIL MOTH.

The general conditions in that portion of the country originally invaded by the gipsy moth, that is to say, eastern Massachusetts, have been better during the past year than for many previous years. This has been due in part to weather conditions, to the prevalence of the wilt disease, to the gradual increase of parasites imported from abroad, and to the cumulative effect of the excellent work done along roadsides by the Bureau of Entomology, in certain forests by the State of Massachusetts, and in the different towns under municipal and State control. The conditions in New Hampshire, however, are much worse than in Massachusetts. Many towns in the southeastern part of the State are seriously infested, and the insect occurs in 125 towns in all. In several of the northern towns the pest has apparently been exterminated. In Maine there has been a further spread, and a new colony has been found in Rhode Island. The brown-tail moth has established itself in the northeastern part of Connecticut.

The increase and spread of the imported parasites and natural enemies of both the gipsy moth and the brown-tail moth has been gratifying, and several species have been brought in during the past year in large numbers which the Bureau of Entomology had not previously been able to secure. During the summer an imported Japanese egg parasite, which had previously been thought to have died out, was recovered in considerable numbers. An appreciable effect upon the numbers of the gipsy moth as the result of parasitic work is beginning to be noticed.

New studies have been begun of the feeding habits of the newly hatched caterpillars of the gipsy moth, and already it seems that it will probably be possible to control the gipsy moth in forested areas by a certain variation in forest management dependent upon the feeding habits of the young caterpillars. This means that the forests of New England, and later other portions of the country, are not doomed, and that a good stand of timber can be maintained even should the pest increase beyond the ultimate control of the parasites, and this in itself is most unlikely. It appears, in fact, that the number of species of forest trees upon which the young

gipsy moth larvæ can feed and maintain themselves until they reach a considerable size is very limited.

THE ALFALFA WEEVIL.

The situation regarding the alfalfa weevil, an insect obviously imported from Europe, and which became established in the vicinity of Salt Lake City, Utah, is continuing to become more serious and alarming. The last Congress made immediately available \$10,000 for an investigation of the pest. Experts of the Bureau of Entomology, working in cooperation with the Utah Agricultural Experiment Station, have traced the spread of the insect from Salt Lake City south to Springville and north to Ogden, west to beyond Tooele and east to Wyoming. Judging from what has been observed between Salt Lake City and Ogden, and between Ogden and Brigham, the uniform normal spread of the pest is about 30 miles a year, though circumstances may greatly change this. Many experiments have been carried out with mechanical devices for destroying the pest in infested alfalfa fields and thereby protecting the second and third crops. An investigation was made of the parasites of this weevil in Italy, and during March and April last large lots of the stems of alfalfa containing eggs parasitized by a minute parasite were sent to Salt Lake City, arriving there in good condition and the parasites emerging in numbers. Three other parasites were sent over later, and an attempt is now being made by agents of the bureau to establish them in the Utah alfalfa fields.

WORK IN THE ORANGE AND LEMON GROVES OF CALIFORNIA AND FLORIDA.

In my last report I mentioned the completion of the study of the problem of hydrocyanic-acid gas fumigation in California, directed against certain scale insects on citrus trees, and stated that the careful experimental work carried on had resulted in a great reduction in the cost of fumigating, since one treatment under the new methods was as lasting in its effects as three or four distinct treatments under old commercial methods. Observations during the past year have shown that this was an underestimate, and that an orchard once fumigated will remain clean for three years before it is necessary to repeat the operation. Thus the cost of keeping an orchard free from scale is now only one-sixth of what it used to be in the days of commercial and unscientific treatment.

The work in Florida against the white fly having demonstrated that in most cases the gas treatment is too expensive, attention has been directed to the determination of the most practical and effective spray application. Tests have been made on a large scale, often over entire orchards, with a variety of insecticides, and it now seems

rather well demonstrated that spraying will, under Florida conditions, be more generally adopted in the future than control by fumigation. The expert who was sent abroad in a search for the original home of the white fly, and with the idea of importing from this locality, when found, parasites or natural enemies which could be established in the Florida orange groves, has been successful in at least a part of his mission. In November, 1910, he found the white fly at Seharunpur, India, under conditions that appear to indicate that the white fly is indigenous to that part of the world. He has found that it is attacked by two species of ladybird beetles, and he has also found an internal parasite. A large part of the present year has been devoted to the effort to secure the parasites in sufficient numbers and in proper condition to permit sending them successfully to this country. He has established the white fly on small growing trees, and has secured living specimens of the parasite breeding in these white flies, and the trees themselves will be brought to the United States in Wardian cases.

The investigation of the orange thrips, begun at Lindsay, Cal., has been extended to southern California, especially in the Riverside district, where it seems to be causing considerable damage. Application of a spray consisting of a lime-sulphur solution with a tobacco extract added is the best remedy so far found.

WORK AGAINST FOREST INSECTS.

It is significant of the practical nature of the methods of bark-beetle control recommended by the Bureau of Entomology and of the practical demonstrations that have been carried on that no complaints of depredations have come to the bureau during the year from the areas in Colorado and Montana where control work was carried on in previous years according to the instructions of the bureau. During the past year the work has been principally in the way of practical demonstrations, as the result of the investigations of previous years. As an example, in cooperation with private owners in the vicinity of Columbia Falls, Mont., over 10,000 trees were treated. Formerly 10,000 trees died each year, but as the result of last year's work only 2,000 required treatment this year within an area of more than 100 square miles. This is undoubtedly the direct result of the control work of last year, which cost nothing, since the treated trees when utilized for fuel and lumber are worth far more than the cost of treatment. Work done in cooperation with the Interior Department on the Glacier National Park resulted in the treatment of 1,295 trees in the vicinity of McDonald Lake, and the present conditions indicate that the work has been successful in arresting the spread of the damage.

Active control work was undertaken in northeastern Oregon in the fall of 1910, and was completed June 30, 1911. This work was done by the Bureau of Entomology, in cooperation with the Forest Service, with private owners, and with the General Land Office of the Department of the Interior. The preliminary reports indicate that 27,158 trees were treated at a cost of \$33,180 to the Forest Service, and that 6,853 trees were treated at a cost of \$2,806 to private owners. More than 100 men were engaged in the work during May and June. The results of this large control demonstration can not be known until the close of the present fiscal year, but it is believed that they will prove to be successful, and that the demonstration of methods and the training of men for control work will be of the greatest value in the future.

It is estimated that the timber saved as the direct result of control work in the Rocky Mountain region, under instructions from the Bureau of Entomology or according to its recommendations, represents a stumpage value of \$2,000,000.

INSPECTION WORK.

In my last report I called attention to the urgent need of the passage by Congress of a plant quarantine and inspection law, and showed that the United States is the only great power without a law to protect it from the introduction of plant diseases and insect pests. Practically all of the European and other foreign powers have such laws, as have also Canada and the other important English colonies. The United States has become a dumping ground for refuse stock, much of which comes to this country to be sold by auctioneers under the hammer. The better class of nursery stock is also often infested with insect pests or diseases which could be detected by proper inspection. More than half of the important insect pests of the fruit and farm products of this country were originally brought in on imported nursery stock, and these now occasion an annual tax of several hundred millions of dollars. The San Jose scale, the cotton boll weevil, the gipsy moth, and the brown-tail moth are instances of accidental importations, and the alfalfa weevil mentioned in a previous paragraph is another. Since my last report infested stock has been constantly coming in. The Bureau of Entomology has been notified by the customhouses and by the railroads when plants are received, and such arrangements as could be made for inspection at points of destination have been carried out. In most of the States there are efficient inspection laws and efficient inspectors. To exemplify the danger of the present condition of affairs, during the past year a careful inspection of the importations by the Department of Agriculture showed that more than 20 different pests had been brought to Washington from foreign countries on plants. Of course

these were intercepted and destroyed, but the presence of 20 new pests whose capacities for crop destruction were undoubtedly very great affords the strongest possible argument for the passage of a National plant quarantine and inspection law. On three different occasions during the past year the gipsy moth has come in on imported stock consigned to different localities in the country.

OTHER WORK.

Other important operations carried on by the bureau during the year may be briefly mentioned. The work against the cotton boll weevil has been continued. The weevil extended its range during the year into the State of Alabama. On the other hand, it was entirely absent from certain regions in northern Texas, where it was present last year. It also did no noticeable damage in Oklahoma. Studies of the parasites of the weevil were continued, and Texas parasites were introduced at two points in Louisiana. The work on tobacco insects was also continued. A notable discovery was made with regard to the so-called tobacco wireworm which indicates that it can be controlled by cultural means. It feeds naturally upon certain weeds and these weeds are eliminated by rotation of crops. In the study of sugar-cane insects new points of importance were ascertained. The Argentine ant and the cotton red spider work was continued. Demonstration work in the deciduous fruit regions in California, with remedies for the pear thrips, was carried on with excellent success, indicating that in prune orchards the yield from an acre treated according to the directions of the bureau reached a value of \$367.93, where an untreated acre yielded only \$6.65. Work upon the codling moth, plum curculio, Hessian fly, and the jointworm has been continued with success, and important advances have been made in methods of fighting insects affecting vegetable crops and stored products. Information on the subject of the house fly as a carrier of typhoid fever and on malarial mosquitoes has been published, and the study of the tick which transmits Rocky Mountain spotted fever has been completed. Further studies upon the cattle tick have been made, and an investigation of the possible influence of certain insects in the carriage of pellagra has been begun. The work on bee diseases has been continued.

BUREAU OF BIOLOGICAL SURVEY.

RATS AND THE PLAGUE.

The rat is one of the most destructive mammals known, and the vast losses it annually causes in the United States call for increased efforts to reduce its numbers and to exterminate it wherever possible. Moreover, the continuance of the bubonic plague in foreign countries.

with which we have constant trade relations emphasizes the danger of the landing of plague-stricken rats from incoming ships, and renders imperative the need of perfecting means for the destruction of these vermin, now believed to be the chief means for disseminating this dread disease. During the past year experiments were continued to discover effective means of reducing the numbers of this pest, without the discovery, however, of methods superior to those recommended in Farmers' Bulletin 369. While poison and traps must continue to be the chief means of reducing the numbers of these mischievous rodents in public buildings, dwellings, stores, and warehouses, it can not be too strongly urged that preventive methods are vastly easier, much more effective, and in the long run cheaper. The rat-proofing of buildings, especially those in which foodstuffs are stored, should be insisted on as far as possible. This precaution, coupled with the withholding of food so as to reduce reproductory powers and make trapping and poisoning effective, will result in materially reducing the number of the pests and lessening the danger from them.

GROUND SQUIRRELS AND THE PLAGUE.

Throughout much of the region west of the Mississippi River ground squirrels of many species abound. In past years much time and attention has been given to the study of the habits of these rodents and of methods of controlling them, since wherever found they are exceedingly destructive to farm crops, and in irrigation districts they do much damage by burrowing into embankments, thereby causing costly breaks. The spread of bubonic plague by rats to the ground squirrels of California, discovered by the Public Health and Marine-Hospital Service, is a matter of national importance, since there is danger not only that the disease may become endemic in that particular State but eventually, through the agency of other species of ground squirrels, spread to neighboring States and thus threaten the whole country. As yet plague germs have been found in only one other native rodent, the California wood rat, and in only one individual of that species. The destruction of a mammal so numerous and so widely distributed as the California ground squirrel is a very serious undertaking on account of the great cost involved, and yet safety from the plague can apparently be fully assured in no other way.

During the year careful experiments were made to discover, if possible, better and cheaper methods of poisoning ground squirrels, and a circular embodying the results of these experiments was published. The formulas in Biological Survey Circular 76 can be confidently recommended for cheapness and effectiveness. This circular has been widely distributed throughout California, with a view

to stimulating activity on the part of resident farmers and landowners generally in the work of ridding their lands of ground squirrels. When fully advised of the importance of the work, they have usually shown themselves ready to do their part. The present law of California, which requires the cooperation of all landowners in the work of exterminating ground squirrels, will, if fully enforced, go far toward providing a remedy, especially if the State, through county and other officials, arranges for furnishing poison or poisoned bait in necessary quantities to landowners at cost. By providing centers of distribution the poison can be supplied ready for use at comparatively low cost, which will greatly stimulate its use by farmers and others.

RELATION OF NATIVE MAMMALS TO SPOTTED FEVER.

The recently ascertained agency of certain of our native mammals in the transmission of diseases vastly increases the importance of a knowledge of the exact range of the species concerned and their habits. It is now known that the so-called spotted fever of the Rocky Mountain region is transmitted from certain native mammals to men through the agency of ticks. In its most virulent form this fever, fortunately, has a restricted range, being confined to a portion of Bitterroot Valley, western Montana; but in milder form it prevails in parts of Idaho, Wyoming, Utah, and Nevada, and probably elsewhere in the Rocky Mountain region. During the past year the Biological Survey, the Bureau of Entomology, and the Agricultural Experiment Station of Montana cooperated in a field and laboratory study of the agencies and manner by which the disease is transmitted to human beings. The work of the Biological Survey was chiefly confined to ascertaining the species of native mammals which carry ticks in any stage of development, since presumably one or more of these mammals is, if not the original, the chief source of infection.

A collection of the mammals of the valley and adjacent mountains was made and the ticks discovered were turned over to the assistants of the Bureau of Entomology for experiment and study. No fewer than 18 species of mammals were found to harbor fever ticks—proof of the great difficulty that must necessarily attend any attempts to exterminate all the wild hosts of the ticks over the region in which the fever prevails. The mammal found to be most frequently infested—possibly in this respect equaling all other wild mammals combined—is the common ground squirrel of the region (*Citellus columbianus*), which abounds over much of the valley. As a very important step in the suppression of the disease, a thoroughly organized campaign to exterminate this squirrel within the limits of the

valley should be made. Such a campaign may be urged on the double ground of the public health and the advantage of the farmer, since this mammal is a very serious pest, not only in this particular valley, but wherever grain is sown in Washington, Oregon, Idaho, and Montana. In connection with a study of the local wild mammals, an assistant of the Biological Survey during the coming season will demonstrate to the people within the infested district the best method of exterminating this ground squirrel and other wild mammals that carry ticks. By means of State or county cooperation the small tick-carrying mammals of the western side of Bitterroot Valley, the area chiefly affected, could be exterminated at a comparatively small outlay of time and money.

PRAIRIE DOGS.

Prairie dogs continue to be a scourge to farmers in many sections of the Middle West, and they exact heavy toll also from the stockmen by eating nutritious wild grasses which form the main reliance of range cattle. Their colonies sometimes number thousands of individuals, and as it requires only about 200 to consume the forage of a steer their colonies collectively are a heavy drain on both pasturage and crops. During the year many experiments have been made with a view to finding better methods of poisoning or otherwise destroying these animals without at the same time endangering the lives of valuable birds.

SILVER FOX INDUSTRY.

During the past year many inquiries have been received from various parts of the United States regarding the practicability of rearing the silver or black foxes for profit, and there is a steady demand for the Farmers' Bulletin on this subject. Interest in the business has no doubt been stimulated by the enormous prices obtained for skins, and even larger sums paid for first-class breeding animals. Efforts are being made to obtain all possible information as to the success of breeders who have engaged in the business with a view to issuing a supplemental report on the industry.

WOODPECKERS.

As a class, woodpeckers are among our most useful birds. They destroy numbers of noxious insects and lend effective aid to the preservation of forests, city shade trees, and fruit orchards. A bulletin on these birds was issued during the year, analyzing the food they eat, explaining the ways in which they are of value to the farmer, and indicating methods by which their number may be increased by the use of artificial nesting sites.

Unfortunately there is one small group of woodpeckers, properly known as "sapsuckers," which are destructive rather than beneficial. Still they must be credited with doing some good by eating insects, though they do much injury by pecking holes in the bark of trees, especially fruit trees, for the purpose of obtaining the inner bark and the sap, both of which are highly relished for food. As they return to the same tree time after time, and often season after season, the area denuded of bark constantly grows larger, and many young trees are killed. Moreover, the effect of their boring is visible in the shape of checks, distortions, and stains years afterwards when the trees are felled and worked up into lumber. It has been estimated that the damage to wood products in the United States by these sapsuckers is more than a million dollars yearly. This investigation of the habits of the sapsuckers and the kind and extent of the injuries they inflict on trees and lumber appears in the form of a bulletin, together with suggestions as to the best method of protecting trees from their attacks.

SHORE BIRDS.

Notwithstanding their small size and the fact that many of them retire to the far North to breed, our shore birds have been so ruthlessly pursued by gunners that all of them are fast diminishing in numbers, at least one species has been exterminated, and several others are nearing the same end. The value of shore birds as food is widely recognized and is indeed the chief cause of their present scarcity. But few are aware that many of them do good service by eating noxious insects, including mosquitoes in the larval state. Being valuable both for food and because they destroy insects, their extermination would be a calamity, especially as during some part of the year they visit every State in the Union and range from ocean to ocean. The prohibition of the sale of these birds, the abolition of spring shooting, and the restriction of the bag limit in the open season will probably result in preserving the several species for future generations.

CRAYFISH.

In certain regions of the Southern States, particularly in north-eastern Mississippi and Alabama, crayfish are very numerous, and in their early stages do much damage to crops, such as corn, cotton, and other staples. In the States mentioned they infest a territory of approximately 1,000 square miles and in certain restricted sections fairly swarm, their holes numbering thousands to the acre. In such places successful crop raising is impossible, and a large acreage noted for its fertility is practically useless because of the

depredations of these crustaceans. Investigations have been begun, having in view the discovery of a method of trapping the crustaceans in large numbers and their utilization for food, or their destruction in their holes by means of a deadly gas. The experiments are not yet far enough advanced to warrant definite statements, but excellent results have been obtained by the use of gas.

BIOLOGIC SURVEY OF CANAL ZONE.

The construction of a canal across the Isthmus of Panama from ocean to ocean must ultimately affect the distribution of marine life along both coasts, while the physical changes wrought along the line of the new waterway, including the creation of a great fresh-water lake, the destruction of a belt of native forest, and the inevitable introduction by commerce of new forms of both plant and animal life, must also considerably change Isthmian biology. A biologic survey of the Isthmus for the purpose of adding to our scientific knowledge of this recently acquired strip of territory and as a means of determining the nature and extent of future changes seemed very important, and a plan of work was entered into in cooperation with the Secretary of the Smithsonian Institution, the Secretary of War, and the Secretary of Commerce and Labor. Under this cooperation an assistant of the Biological Survey has for several months been engaged in making collections of the birds and mammals of the Canal Zone as a basis for a comprehensive report upon these branches. The Isthmian region is rich in both these groups, and the collections already sent in are an earnest of the rich harvest of scientific data and specimens to be expected when the work is completed.

EXPEDITION TO LAYSAN ISLAND.

One of the largest sea-bird rookeries in the world is that on the island of Laysan, the most important of a series of oceanic islands, some 600 miles northwest of the Hawaiian Islands. These islands were set apart as a bird reservation February 3, 1909.

About two years ago Laysan was raided by alien feather hunters and a vast number of birds were killed for their plumage. During the year the University of Iowa planned an expedition to the island in order to secure material for representative groups of sea birds to form part of the university museum exhibit, and the cooperation of this department was sought for the purpose. The four men selected by the university were appointed temporary wardens of the department and, in addition to a representative series of the birds of the island, they will furnish a detailed report of the present condition of the rookeries, the number of birds that breed there, and the effect on the prosperity of the colony of the raid of the feather hunters mentioned above.

BIOLOGICAL INVESTIGATIONS.

Biological investigations have been carried on during the year in Alabama, Arkansas, Idaho, Kentucky, Montana, Tennessee, Wyoming, and Virginia, and the information gathered has added much to our knowledge of the distribution, abundance, habits, and economic relations of mammals and birds. It has also yielded data for numerous corrections of life and crop zone maps and enabled answers to be given to numerous inquiries as to the crops best suited to specified areas.

A revised and corrected edition of the zone map of North America has been published during the year, and for the first time the outlines of the Tropical and Hudsonian Zones have been shown with some detail. While mainly extralimital, both these zones are represented in the United States; the Tropical in Florida, the Hudsonian on the higher mountains and in Alaska.

A report on the biological survey of Colorado has been issued and distributed. It covers the subject of life and crop zones of the State and includes a detailed zone map and a fully annotated list of the mammals

GAME PRESERVATION AND INTRODUCTION.

While the need of game protection is each year better understood, and while effective legislation for the preservation of game becomes yearly more general among the States, it is apparent that the extinction of the wilderness by growing settlement must, sooner or later, deprive the United States of most of its big game, except as it may be preserved on lands set apart for that purpose. Hence, in addition to unremitting efforts to prevent rapid destruction of game by market hunting or excessive killing for sport, growing attention is demanded by the question of game preserves, both private and public. The Biological Survey has devoted much consideration to this phase of game preservation, and much work has been done in connection with game preserves and bird reservations.

ELK IN WYOMING.

At the close of the session the Sixty-first Congress made an appropriation of \$20,000 for the feeding, protecting, and removing of elk in the region known as Jacksons Hole and vicinity, Wyoming. As soon as the appropriation became available two representatives of the Biological Survey were sent to Wyoming to do whatever was possible for the starving elk. As all the available hay had been secured by the State and was being fed to the elk, attention was turned to other phases of the problem, such as the conditions responsible for lack of food, the number of elk that died from starva-

tion, the possibility of securing an adequate supply of hay for next winter, the location of available sites for winter refuges, and the practicability of transferring elk to other localities. As an experiment two small herds were transferred to the National Bison Range and the Wichita Game Refuge, and careful consideration has been given to the feasibility of moving others to the Medicine Bow Mountains and the Big Horn Range next winter. In short, a thorough study is being made of the elk problem in all its phases, and a report on the subject will soon be ready.

IMPORTATIONS.

The necessity for constant watchfulness to prevent the introduction of foreign birds and mammals likely to become pests continues to be manifest. Three mongooses brought to New York in February, 1911, were promptly killed on board ship, and one mongoose and two flying foxes on exhibition at Kansas City were placed in the safe custody of zoological parks.

The importation of European partridges, which last year dropped from 30,000 to 18,000, rose again to 36,507. While this increase seems to show a growth, or at least a continuance, of the popularity of this bird for stocking covers, yet from other sources it is evident that repeated failures to acclimatize it have had a discouraging effect. It is important to note that 10,000 of the partridges imported in the current year were consigned to one destination—the State of Iowa, which has undertaken the experiment of acclimatization on an unusually large scale.

BIRD RESERVATIONS.

One new bird reservation was established during the year on the Clear Lake Reservoir in the northern part of California, a few miles southeast of Klamath Lake. This reservation, which increased the total number to 52, is an important breeding ground for birds. Owing to the growing importance of questions arising in connection with three of the reservations in Oregon and Idaho, an inspector was appointed to visit them from time to time. Adjustment of relations with the public in connection with the maintenance of the Deer Flat Reservation will require careful consideration. The Deer Flat Reservoir is the stopping place for thousands of ducks and many other waterfowl in the fall migration; it promises also to be an important nesting ground for waterfowl in the future. It is essential, therefore, that it receive special attention if its purpose as a bird reservation is to be maintained. The lake, however, is situated only 6 miles from Caldwell and is likely to become a summer resort. A trolley line connects it with Caldwell, and boats have been placed on the water for the use of excursionists. It may be found necessary to keep part

of the lake free from intrusion by pleasure seekers, at least during the nesting season. The question of stocking the reservoirs of Cold Springs, Oreg.; Deer Flat and Minidoka, Idaho; and Belle Fourche, S. Dak., with fish was taken up with the Bureau of Fisheries, and it is probable that these reservations for birds will soon become reservations for fish as well.

NATIONAL BISON RANGE.

No damage was done to the National Bison Range, in Montana, by the forest fires of 1910, although they raged around it only a short distance away. Fifteen buffalo calves were born in the spring of 1911, and 3 adult buffalo, presented by the American Bison Society, were placed on the range. Twelve antelope from the Yellowstone National Park and 7 elk from Jacksons Hole, Wyoming, were added to the occupants of the range during the year. Four of the antelope died, and as no deer have been seen recently, the game on the range at the close of the year comprised 66 buffalo, 8 antelope, and 7 elk. In this connection it may be mentioned that the American Bison Society is taking steps, in cooperation with this department, to secure ground for an additional bison range in South Dakota.

ALASKA.

More rigid protection of deer and walrus in Alaska having been found necessary, new regulations were issued on July 29, 1910, shortening the hunting seasons, limiting the number of deer which may be killed by each hunter, preventing the sale of venison during 1911, and prohibiting all killing of walrus in Bristol Bay and south of the Kuskokwim River until 1912. Only five wardens were employed during the year, but this number will be augmented next year owing to an increase of \$5,000 made by Congress in the appropriation for warden service in 1912.

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

During the year there were received, audited, and paid 118,921 accounts, amounting to \$15,736,198.02. More than 4,200 of these accounts, moreover, were so-called combined accounts, in connection with which there was probably a saving of at least 21,000 checks, to say nothing of the saving of other clerical labor in connection therewith. There were also audited and sent to the Treasury for payment 4,368 accounts. In the payment of the 118,921 accounts mentioned above it was necessary to draw 244 requisitions on the Treasury and subtreasuries and issue 225,019 checks. There were issued during the year 27,345 requisitions for supplies, 7,063 letters of authorization for travel, 44,976 requests for passenger travel, and

9,020 requests for department bills of lading and requests on the Quartermaster General for the transportation of Government property, while about 158,100 letters were written or received in the ordinary transaction of business.

To carry on the work of the Department of Agriculture during the fiscal year ended June 30, 1911, Congress appropriated \$13,487,636 for the ordinary expenses of the department, in addition to which permanent annual appropriations amounting to \$6,329,000 and special appropriations amounting to \$1,874,614 were available, making a total of \$21,691,250.

The disbursements of the department for the fiscal year 1911 amounted to \$17,188,339.27, and the greater part of the balance of \$4,496,348.68 will be required for the settlement of outstanding liabilities.

The amount for rent of buildings in the District of Columbia for the several branches of the department was \$70,481.86.

All accounts for the fiscal year 1909 having been settled, the unexpended balance of appropriations for that year, amounting to \$306,333.71, was covered into the Treasury on June 30, 1911. The account for the fiscal year 1910 is still open.

The amount estimated for the fiscal year 1913 in the annual estimates for the regular appropriation bill is \$17,233,452, which includes \$1,440,000 for agricultural experiment stations; in addition to which there will be available permanent annual appropriations amounting to \$5,706,000, making a total of \$22,939,452. There is also an estimate in the sundry civil bill for printing and binding for this department amounting to \$480,000, making a grand total of \$23,419,452, which is an increase of \$340,436 over the appropriations for the fiscal year 1912. This amount will be used for establishing new Weather Bureau stations in the fruit and horticultural sections; for extension of the dairy and animal husbandry work in the eradication of tuberculosis in domestic animals; for an extension of farm management investigations and demonstration work in the northern States, and an enlargement of the scope of pathological investigations; for additional range investigations and tree planting; for an extension of the work under the enforcement of the food and drugs act; for an extension of the soil survey work; for an extension of the work under enforcement of the insecticide act; and for an extension of the work on road management and experimental roads.

DIVISION OF PUBLICATIONS.

The number of different publications, circulars, and reports issued by the department during the year ended June 30, 1911, was 1,953, which is 29 less than during the previous year, but the number of

copies printed for distribution to farmers and others interested in agriculture aggregated 27,594,877, which is 2,404,408, or nearly 10 per cent, more than during any previous year. This gratifying result was accomplished without any increase in the appropriation for printing and with a slight decrease both in the appropriation and in the force available for the division work.

Of the documents mentioned above, 27,250,250 were issued through the Division of Publications, and 344,627 were issued through the Weather Bureau; 18,468,277 copies were of publications issued during the year and 9,126,600 were reprints of publications which had been previously issued, but for which there was still a considerable demand. Of Farmers' Bulletins, 9,219,000 were secured with the appropriation available, 2,054,000 of which were copies of new bulletins and 7,165,000 were reprints. Many of the Farmers' Bulletins have long been in use by the farmers and a large demand still exists for them.

Inasmuch as the amount expended in acquiring the information appearing in the department's publications is more than \$16,000,000, the appropriation of less than half a million dollars for printing and binding, of which only about \$360,000 is available for printing reports, bulletins, and circulars for distribution among the people, in order that they may avail themselves of the results of this outlay and these investigations, is small and inadequate. If the available information could be placed in the hands of every farmer, a fuller measure of usefulness should be achieved by the department.

POPULAR DEMAND FOR PUBLICATIONS.

Even with the increased number of publications printed and distributed during the year, it was impossible to supply the popular demand, which came from every section of the United States and from many other parts of the world. The department would have required at least 5,000,000 bulletins more than were at its disposal to have met the demand fully, and it was found necessary to select and send a few bulletins likely to be most useful to those whose request had been for many more, and by this course make it possible to supply at least some bulletins to each applicant, instead of exhausting the department's supply in attempting to entirely satisfy a few. The distribution of this reading matter widely disseminates information along agricultural lines and is productive of a higher yield of better crops, better breeds of stock, new varieties of fruits, and improved conditions on the farm, the financial value of which alone amounts to millions of dollars annually, but the increase in comfort, contentment, and cheer can not be estimated.

FARMERS' BULLETINS.

With the present appropriation of \$125,000, it was possible to make an allotment to each Senator, Representative, and Delegate of approximately 12,500 Farmers' Bulletins, which was admittedly insufficient in view of the increasing number of requests received from them. Therefore, the matter of securing a sufficient appropriation should be considered with the view to increasing the allotment. Under the law only one-fifth of the Farmers' Bulletins furnished were available for distribution by the department, and this is not sufficient to permit it to comply with one-half of the requests received, and makes it necessary to refer applicants to their Senators, Representatives, and Delegates, who themselves, in many cases, have already exhausted their supply. Hence it is obviously desirable that both the congressional and departmental allotments should be increased. An addition of \$25,000 to the printing bill, available for printing Farmers' Bulletins, would increase the allotment to each Senator, Representative, and Delegate to 15,000, and would enable the department to more nearly comply with the demands made upon it.

AN ALLOTMENT OF EVERY PUBLICATION FOR SENATORS, REPRESENTATIVES,
AND DELEGATES IN CONGRESS.

There is a constantly increasing demand for publications other than Farmers' Bulletins from Senators, Representatives, and Delegates in Congress, which the department is unable to supply, very much to its regret. These publications contain the results of our scientific investigations and experiments acquired at considerable expense, and they should receive the widest possible distribution among the people for whom they are intended. This, however, is not possible under the present system and with the available funds. So satisfactory has been the distribution of Farmers' Bulletins that I am persuaded to recommend that an allotment of every publication issued by the department be made to Senators, Representatives, and Delegates in Congress. They are in close touch with the people and would be able to give the publications a wider and wiser distribution than they now receive. A considerable increase in the appropriation for printing would be necessary, but it is believed that the results would be so valuable and enduring to the people as to justify the additional expenditure. The subject is worthy of serious consideration.

SCIENTIFIC AND TECHNICAL PUBLICATIONS.

Our scientists are constantly conducting investigations and making important discoveries which are of great value to agriculture, but the published results are not always adapted to the present uses

of the great mass of the department's correspondents. The information they contain is necessarily couched in more technical and scientific language than is desirable in popular pamphlets; hence the bulletins are printed in limited editions as permanent records of the achievements of the department in scientific research, and for distribution to libraries, collaborators, and scientists, both in this country and abroad, and to such persons as are likely to find them of special value. Publications of this class represent only about 2 per cent of the total output, but owing to their greater length, the use of more expensive illustrations, and the necessity for more expensive paper, they use up about 20 per cent of the appropriation for printing and binding. The advisability of securing additional funds for publishing larger editions of bulletins of this class should be seriously considered, as it is believed that the publications should have a wider distribution.

ECONOMIES EFFECTED.

The channel through which the department distributes the results of its investigations and other information it desires to disseminate among the people, and especially the rural population, is its publications, the editing and distribution of which is the province of the Division of Publications. It is the function of that division to meet the department's requirements for printing and binding and to accomplish this with an almost always inadequate appropriation. Hence the economies of the division tend in the editorial work to the condensation of statement and improvement in form of the printed documents, and in the distribution work to closer organization and efficiency and expedition.

The extent of the work performed in the division is dependent upon the growth of the department and the activity of its various agencies, and this activity depends upon so many extraneous conditions that it is not possible to even approximate at the beginning of the year the amount of printing which will be required. Its operations, therefore, may be accepted as an accurate index of the department's work. The magnitude of the work devolving upon the editors is apparent when the large number of publications issued and the enormous amount of miscellaneous printing required by the department are taken into consideration.

Perhaps the most striking feature of this division's work was its success in promoting economy. Many manuscripts were reduced in size, illustrations were limited to those absolutely necessary to illustrate the text, and the tables were greatly condensed.

In many cases large savings were effected in the cost by reduction or other changes in the shape or size of blanks, eliminating waste in

cutting the paper and substituting a perfectly satisfactory paper, but of a cheaper grade, for a high-priced article no better fitted for the purpose. The economy effected in this kind of work, however, is not confined to the manuscript and illustrations after being submitted. The division's supervision has exercised a healthful influence throughout the department, tending to a more careful preparation of the manuscripts, a more critical selection and minimization of illustrations, and less change in proof of the authors. The use of a more durable paper for some of the publications of the department has been adopted, insuring the permanent preservation of its valuable publications and at the same time lessening the weight of the bulletins; while for the publications issued in large editions and of a more temporary value a lighter paper has been adopted, reducing both the cost to the department and the cost of transportation through the mails. To add to the value and completeness of the publications indexes are prepared for those which are of such size as to require it. The division also prepares and maintains a detailed card index of the contents of all publications of the department—perhaps the only one in existence.

ILLUSTRATIONS.

During the year the division prepared 1,566 original drawings, produced 71,224 photographs, and filled 224 orders from outside departments for photographic work, which required the reproduction of 2,694 photographs, costing the purchasers \$596.53. On the order of the department 1,252 duplicate electrotypes of illustrations were made for miscellaneous applicants by private firms, for which the applicants paid to the manufacturers a stipulated price per square inch. This growth in the photographic work has continued without increase in force. These facts do not convey an adequate idea of the constantly increasing demand upon that branch of the division from the other bureaus of the department, nor do they indicate the amount of labor and skill necessary to produce such technical and artistically correct illustrations as appear in the department's publications.

SALES OF DEPARTMENT PUBLICATIONS.

As stated above, the department is often unable to furnish publications requested by applicants, either because the supply is exhausted, or because the publication is of such a character that it can not be widely and gratuitously distributed. To meet such cases Congress has wisely provided a relief through the Office of Superintendent of Documents of the Government Printing Office.

This official is authorized by law to sell Government publications at the nominal cost of printing and paper plus 10 per cent, and his

sale of the publications of the Department of Agriculture during the last six years shows how increasingly interested the people have become in the department's work, for in 1906 only 47,745 copies of our publications, costing the receivers \$5,388.28, were sold, while in 1911 the same official disposed of 183,577 copies, at a cost to the purchasers of \$18,657.17. Under the operations of the law the Superintendent of Documents is permitted to reprint and sell publications as long as there is a demand for them, paying for the reprinting out of the receipts from previous sales. During the year he reprinted 633 publications of the department, the editions aggregating 170,325 copies. Thus only 13,252 of the number sold by the Superintendent of Documents were furnished by the department.

In previous years the records of the Office of Superintendent of Documents indicated that the purchases were generally from among the scientific and technical publications of the department, but current records show that while there has been a healthy increase in the number of scientific and technical department bulletins distributed through his office the great increase shown by his report was in the more popular and smaller publications, which give in a practical way the results of the scientific investigations. This proves that the rural population in greater numbers is seeking the aid of the department and is willing to pay for the documents needed when the department's supply will not permit of gratuitous distribution.

PUBLICATIONS FOR RESTRICTED AREAS.

The department's correspondence relating to its publications shows an increasing demand for information relating to particular localities or sections of the country, which it is often difficult to supply in printed form and which requires a disproportionate amount of labor to present in an individual letter.

During the last two years there has been an increasing demand for information in regard to the agricultural possibilities of the different States. Information of this kind can be found in the soil surveys; but these, owing to the colored maps, are expensive, and, moreover, are not available for general distribution, as the editions for departmental use are limited to 1,000 copies. The appropriation for Farmers' Bulletins provides for publications adapted to different sections, and many of those more recently issued have been prepared with a view to the needs of restricted areas. A Farmers' Bulletin for each State, presented in popular style, is therefore contemplated.

LARGER EDITIONS OF 100-PAGE PUBLICATIONS.

Under the provisions of the printing bill now pending in Congress it would be possible for the department to print as many as 2,500 copies of bulletins exceeding 100 octavo pages, which at present and

for several years have been limited to editions of 1,000 copies. In many cases these bulletins have been of great scientific value, and the inability to distribute them more widely among the colleges and universities and in the scientific world generally has been a matter of regret and has deprived many of valuable information. It is hoped that the provision will prevail.

USE OF OUR PUBLICATIONS BY SCHOOLS.

The demand for the department's publications for use in schools of all grades continues to increase and is far beyond our ability to supply. Of course an effort is always made to furnish to each school making requests as varied and as large a supply as the limited number at our disposal justifies, for it is believed that such distribution encourages agriculture and increases the prosperity of the Republic. An increase of the appropriation with the view of more nearly meeting the demands of these young men and women is worthy of serious consideration.

BUREAU OF STATISTICS.

The quantitative interpretation of the figures indicating the monthly condition of those growing crops of which estimates of production are made at the close of each year is an important feature added this year to the crop-reporting system of the department.

Since the significance of the monthly condition figures has been interpreted by the department, the various private interpretations, both by individuals and commercial organizations, differing in their statements, have practically ceased, and it has been generally conceded in all quarters that the interpretations emanating from the Bureau of Statistics are the fairest and the most authentic figures possible to be based on the crop condition report.

All the leading crops except cotton are included in these quantitative interpretations. With cotton, however, it is impracticable to interpret the condition figures, as the amount of abandoned acreage is lacking, can not be ascertained until the close of the season, and is essential to reasonable accuracy in the translation.

COST OF CROP PRODUCTION.

The result of the investigation upon the cost of producing corn, wheat, and oats, published in several numbers of the Crop Reporter, made it evident that the cost of producing crops varies widely in different sections of the country. The average cost per bushel of producing corn was found to be 37.9 cents (including rental charges), varying by States from 30 cents in Iowa and South Dakota to 72 cents in Maine; the average cost of producing wheat was 66 cents

per bushel (including rental charges), varying by States from 44 cents in Montana to 96 cents in South Carolina; and the average cost of producing oats was 31 cents per bushel (including rental), varying by States from 23 cents in Montana to 56 cents in Connecticut.

It is proposed to continue this line of investigation.

PROPORTIONED CAUSE OF CROP DAMAGE.

The results of the first inquiry into the amount of damage done to each important crop in 1909 was published in November, 1910. The summary showed that 81.8 per cent of the total damage is attributed to unfavorable climatic conditions, 4.8 per cent to plant diseases, 7.9 per cent to insect pests, 1 per cent to animal pests, 1 per cent to defective seed, and 3.5 per cent to unknown causes.

CROP REPORTING.

Investigations of the crop-reporting systems of several countries of Europe show beyond doubt that the systems of the countries visited contain no better features, and, as a rule, cover no range broader than our own; in fact, it was found that the system prevailing in this department, and already many years in operation, is far in advance of that of any other country.

Many thousand reports received regularly from the voluntary correspondents are tabulated, and these form the basis of the crop report figures given out each month.

The total number of questions asked of all classes of correspondents in the calendar year 1910 amounted to 2,582. Of these 2,003 were for use in making the crop report and 579 for special investigations. From the township correspondents alone 2,427,000 replies were received.

A notable addition to the monthly reports of prices was a schedule comprising about 30 of the principal products of the farm other than the 14 which are reported on by the county correspondents.

A comparative statement of monthly receipts of eggs and poultry was compiled each month and published in the Crop Reporter, showing the relative increase or decrease from month to month in the quantities received by large dealers who buy from the country, and the receipts at important markets.

If the preliminary work attempted toward compiling a statement of the quantity of apples shipped from the principal producing regions is successful, such a statement will be issued in the near future.

AGRICULTURAL PRODUCTION AND POPULATION.

Owing to the prevalence of high prices there has developed a general impression that the agriculture of this country is unequal to the needs of the increasing population. An investigation of the facts

with regard to this condition failed to establish any cause for alarm. On the contrary, it is evident that this country has been passing through phases of agriculture in which declines in production per acre are the result of exploiting new land and in which recuperation follows with a pace greater than that of increase of population.

Just prior to the close of the fiscal year two investigations were begun relating to the development of agriculture as influenced by transportation companies, one with special reference to such topics as the movement of agricultural population and the occupation of railroad lands, and the other to the changes in the cost of distributing perishable farm products.

COST OF FARMERS' SUPPLIES.

From an extensive inquiry made among retail dealers doing business with farmers it appears that most articles purchased by farmers cost more in 1910 than in 1909, the average increase being about 1.5 per cent. The purchasing power of produce of 1 acre in 1910 was 7.3 per cent less than in 1909, but still about 44.1 per cent more than in 1899.

SEEDTIME AND HARVEST.

An unusually large undertaking of the pioneer sort was the work in the investigation of the dates of planting and harvesting in the United States and foreign countries, which has been continued and is so far advanced that the report on cereal crops, flax, cotton, and tobacco is now in press, and there is prospect of completing the reports on forage crops, truck crops, and seedtime and harvest in foreign countries during the fiscal year 1912. The plans of the work have been original, and in the processes of treating the primary materials for the deduction of conclusions there have been many practical problems to solve.

LIBRARY.

The accessions to the department Library during the past year, exclusive of current periodicals, exceeded those of any previous year and amounted to 8,816, bringing the total number of books and pamphlets on July 1, 1911, to 115,653. More than half of these accessions were received by gift or in exchange for department publications. In addition to the accessions noted above the Library received currently nearly 2,000 periodicals.

During the year the Library completed the first volume of its Monthly Bulletin, for which an author index was issued, thus rendering the Bulletin more useful for reference than was the case with the former list of accessions.

Although the Library's collection of books on agriculture and related subjects is probably unsurpassed in the country, the resources of other libraries are also used to aid in the investigations of the department, 6,397 volumes having been borrowed during the year from Washington libraries and 69 from libraries in other cities. On the other hand, the department Library is frequently called upon to lend books to scientific institutions outside the city, especially to the State agricultural colleges and experiment stations. During the year 615 books were thus lent. Several of the other Government offices in the city also use the Library freely.

During the year about 2,000 duplicates received by the Library, for the most part official publications, were distributed to the libraries of the State agricultural colleges and experiment stations to help in completing their files.

OFFICE OF EXPERIMENT STATIONS.

RELATIONS WITH AGRICULTURAL EXPERIMENT STATIONS.

The better financial conditions resulting from the increased Federal funds and other resources, as well as the growing demands of a progressive agriculture in general, have continued during the year to increase the working efficiency of the experiment stations and to widen the scope of their activities.

The appropriations provided for by the acts of Congress, which were received by 56 of the stations, amounted to \$1,539,000 for the fiscal year ended June 30, 1911. The appropriations made by State legislatures for the work of the experiment stations again amounted, during the year, to over \$1,000,000, and the fees received from the different kinds of inspection work, together with the amounts realized from the sales of farm products and secured from other local sources, aggregated about \$500,000.

Progress was made during the year in widening the scope and increasing the efficiency of extension work. To this class of work over 100 persons are at present devoting their entire time. The organization, development, and growth of extension departments as separate branches indicate that it is realized that the stations themselves must remain true to the purpose for which they were established and for which they are maintained, namely, scientific investigations of the problems relating to agriculture.

One of the important features of the stations' work has related to dry farming, with a bearing not only upon the crops and methods of culture adapted to regions of deficient rainfall, but also upon the complex relations of water to the growth and health of plants, the nature of drought resistance, and the means of producing plants resistant to adverse climatic conditions. The California Station, among

others, made notable progress in the study of the relation between the water supply of the soil and the growth and health of plants, i. e., the true duty of water in plant growth. It has been shown that, while deficiency of water retards the growth of plants, excess of water, as in careless irrigation, may seriously affect their health.

The work of the stations is emphasizing more strongly each year the fact that progress in the improvement of agricultural crops must be based upon a fundamental, scientific knowledge of the nature of the qualities it is desired to develop and perpetuate, as, for example, yielding capacity, drought resistance, disease resistance, hardiness, and the like.

The Wisconsin Station is preparing to distribute a considerable number of new varieties of plums and apples that have been developed at the station. In 1910 it distributed over 300 pounds of improved tobacco seed to growers in the State. Pedigreed barleys have been disseminated through the Wisconsin Experiment Association. The work has been extended to include boys' clubs, and contests have been arranged in growing corn, barley, and oats, \$18,000 in premiums being offered in various fairs, contests, etc. The yield of a pedigreed strain of oats on the station farm is reported at 76 bushels per acre.

The plant-breeding work in the department of horticulture in the South Dakota Station has become very extensive. Some excellent hybrid plums, plum and sand-cherry crosses, and hybrids of raspberries have been given to the public, and others are receiving final trial before they are distributed. The hybrids of purple-leafed plum of Persia with the sand cherry have turned out to be valuable ornamentals, and the union of the native plum and the Chinese apricot has resulted in varieties promising as profitable market fruits. A hybrid raspberry sent out from the station is winning much favor over a wide area of the Northwest and is the hardiest raspberry so far produced. The same department is carrying on alfalfa-breeding work, in which seven or eight species of *Medicago* are being used, to develop hardy strains for hay, pasture, and seed production. This station is also carrying on work in the breeding of sugar beets in cooperation with this department. This work has so far resulted in more than 40 different strains of selected beets, as many more cross-bred varieties, and a number of single individuals selected on account of excellence. As a result of several seasons' work it is claimed that hybrid sugar beets have not given as good results as those developed from a process of straight selection from known mother beets. In sugar-beet breeding work carried on by the Utah Station, strict methods of pedigreed breeding are employed, and the total hereditary power of each original mother is ascertained. The seed produced last year showed a gain of over 1½ per cent in the sugar content as compared with the imported seed of the same original strain.

Many of the stations have achieved noteworthy results and observed valuable points in the improvement of field crops.

The work of the North Dakota Station in plant breeding was particularly large in breeding alfalfa, corn, and winter grains. The blue-stem wheat was largely disseminated through the demonstration farms; the result of 17 years' work was the first blue-stem seed distributed by the station. The yield at the station in the very dry year of 1910 was 27½ bushels per acre on 5 acres, while the average wheat production for the entire State was estimated at only 5½ bushels per acre. A winter rye bred by the station proved hardy to a considerably greater degree than common rye sown in the country and gave greater yields. In a similar way the development and distribution of new varieties among farms of the State was continued by the Minnesota Station. A new variety of winter wheat and three varieties of oats originated at the station, and which outyielded ordinary grains by 15 to 25 per cent, were distributed. One variety each of wheat, oats, corn, and flax originated and sent out by this station have become known commercially and are now quite widely grown in Minnesota and the adjoining States.

The increase and fixation of desirable properties in plants by the Ohio Station included work with 130 strains of alfalfa propagated from seed from as many different plants, 245 strains of red clover, 100 strains of corn, 569 strains of oats, 125 strains of soy beans, and 1,560 strains of wheat. Pedigreed strains of corn have been developed which are thus far yielding 5 to 14 bushels more than the original varieties; pedigreed strains of oats and wheat are yielding 3 to 6 bushels more than the original stock, and soy beans 2½ to 6 bushels more. It is estimated that the hybrid wheats originated and distributed by the Washington Station for the last four years resulted, in the season of 1910, in an increase of 1,500,000 bushels in the production of wheat.

Special attention is being given to problems of soil bacteriology, including the importance of humus as a medium of existence for the soil organisms which have to do with soil fertility. The Colorado Station has demonstrated the occurrence of areas of soil in irrigated orchards and sugar-beet fields containing nitrates in such excessive amounts as to destroy the crops. Apparently the excess of nitrates is due to phenomenal bacterial activity, and the problem is to devise means for the utilization of this rapid nitrate formation for beneficial purposes and to prevent it from becoming a menace to crops. The California Station in studying soil bacteria under arid conditions found nitrifying bacteria down to a depth of 12 feet, while in humus soils they occur within the first 6 inches. Results secured at the Kansas Station suggested that plowing from 8 to 10 inches deep tends to increase the number of soil bacteria in both sandy and silt

soils, and also tends to increase bacterial activity. The maximum number of bacteria was found within the fifth and sixth inches of the soil. An increase in soil temperature was found to increase the activity of the bacteria and an excess of moisture to reduce their number. The Montana Station observed that where moisture content of the soil was good the nitrate formation was relatively high. In connection with these studies it was shown that the great benefit from summer fallow was due to nitrates accumulated in the moist soil during the fallow season, which gives a rapid growth the following year, so that the crop usually has advanced beyond the stage of liability to serious injury before the dry period of the year arrives.

The Utah Station in studying the formation and movement of nitrates in irrigated soils found that the nitric nitrogen tended to accumulate in the lower foot sections during winter and spring.

In a series of feeding experiments the Nebraska Station demonstrated that when corn is above 35 cents per bushel and alfalfa not over \$7 per ton, the old method of fattening cattle for market, which consists of feeding heavily with grain and using little roughage, is much less profitable than a moderate use of grain and correspondingly more roughage. In a five-year trial of fattening cattle on bluegrass pasture at the Missouri Station, better gains were made and a more uniform finish was obtained when corn was substituted for either gluten, linseed, or cottonseed meal.

The Tennessee Station has worked out double cropping systems for the State under which two crops are grown on the land annually, and in that connection has been able to maintain a steer for every acre in this work.

The North Dakota Station conducted feeding experiments with hogs, in which different feeds were compared. It was found that corn produced a much larger proportion of fat than barley and in consequence made a poorer grade of pork. It required 18 per cent more of barley than of corn to produce a given gain in weight. Another test showed that ground rejected wheat produced good gains when fed to swine with shorts. In comparison with corn it required 8.9 per cent more rejected wheat than corn to produce the same gains, but the quality of pork produced was better than that produced on corn.

Several of the stations have shown that heavy feeding of silage—up to over 40 pounds a day—can be followed with advantage in fattening cattle. In one instance 3 pounds of gain a day were made in this manner, with little grain, and the beef was finely finished. In this connection it is worthy of mention that a number of stations have given considerable attention to silo construction. The Iowa Station has designed a silo built of hollow tile, reenforced between courses of

blocks, which is proving very efficient and cheaper in construction than concrete where sand and gravel have to be shipped in.

In testing different methods of preparing corn for hogs, the Iowa Station found that the most satisfactory results were secured from feeding dry ear corn until the hogs weighed about 200 pounds. For heavier hogs soaked shelled corn gave the most economical gains of all the forms in which corn was fed. In experiments in hogging down corn this station has produced pork at less than 3 cents a pound.

At the New York Cornell Experiment Station it was found that mangels raised at a cost of \$1 per ton and judiciously used to take the place of one-half of the grain ordinarily fed are profitable in feeding the dairy cow.

The results of shelter experiments conducted at the Pennsylvania Station showed that steers fed in an open shed on succulent rations, including silage, made more rapid and cheaper gains and attained a higher finish than similar cattle fed in the same way in the basement of a barn.

Along horticultural lines studies at the Missouri Station on the dormant period of plants have shown that hard freezing or severe drought will force the development of buds, and that anything that will delay ripening will cause a prolonged resting period. Late growth due to fertilizing and cultivation has resulted in heavy crops of fruit where frosts destroyed those in orchards which were permitted to mature in a normal manner. Peach trees pruned according to the methods advocated by the station were made to produce two additional crops in eight years. Last year the Jonathan apple orchard on the horticultural grounds returned over \$300 per acre, while unsprayed Jonathan apples in the neighborhood had almost no marketable fruit. In a demonstration experiment a sprayed acre of Jonathan apples in a commercial apple orchard produced more marketable apples than the remaining 139 acres which were not sprayed.

The Arizona Station has worked out two methods of artificial ripening of dates, which will largely overcome the failure of the fruit to ripen sufficiently early and its tendency to sour in damp weather during the ripening period. One method depends upon stimulation of the ripening process by chemicals at ordinary temperatures; the other method consists in heating under controlled conditions of moisture. Both methods are practiced and give a finished product of high quality. The Arizona Station now recommends the planting of Deglet Noor palms in the Salton Basin, along the lower Colorado, and in southern Arizona up to the altitude of 1,200 feet.

After experimenting with orchard fertilizers for 15 years, the New York State Station has concluded that commercial fertilizers are of little benefit to young apple orchards growing on soils naturally suited to apple culture, provided the orchards are well tilled, well drained, and properly supplied with organic matter from stable manure or from cover crops.

The entomologist of the Kansas Station has demonstrated the practicability of high temperatures as an efficient method of control of insects in stored grains. The method has been successfully installed in several mills in the State. He has also shown that the chinch bug winters in bunch grasses in Kansas, and that burning over these areas materially reduces the attack of the chinch bug the next year. In connection with inspection work carried on in co-operation with the State horticultural department and provided for by the State horticultural law, the Maryland Station discovered over 700 nests of the brown-tail moth in imported nursery plants and destroyed them to prevent distribution.

The New Hampshire Station demonstrated the possibility of controlling the black fly in the White Mountains by treating streams where these flies breed with a suitable soluble oil, which kills the larvæ without injury to the trout in the stream.

The veterinary department of the Delaware Station, in cooperation with the Bureau of Animal Industry of this department, has produced a serum with which sheep may be protected against an otherwise mortal dose of anthrax bacilli and an immediate passive immunity produced. In an investigation of the strongyloid parasites of calves the South Carolina Station has found that their attack may be avoided by keeping animals on other than low, moist pastures.

The Minnesota Station reports in its studies on stable ventilation that the relative percentages of oxygen and carbon dioxid do not seem to be of material effect, but that the confined air seems to influence the kidney secretions. It was observed during the year that pigs from immune sows appear to be born with very high resistance to cholera. This natural immunity was found to disappear gradually, but was sufficient up to at least 5 weeks of age to make it possible to inoculate such pigs with very high virulent blood with an unimportant percentage of loss.

The California Station found that under California conditions the use of bovo-vaccine seemed to produce some immunity against tuberculosis but to fail in protecting calves until $2\frac{1}{2}$ years old. It was also found that tuberculosis spreads rapidly in cattle under strictly outdoor conditions.

The dairy expert of the New York Cornell Station in his work with the milking machine found that immersion of the milking parts

of the machine in a 10 per cent solution of common salt between milkings was more efficacious than steaming. The germ content of the milk was found to be determined largely by the efficiency of the air filters of the machine.

The principles underlying the making of ice cream and the factors which influence the process and the product were studied extensively at the Vermont Station, and an epoch-making bulletin was issued on the subject. The Iowa Station published a bulletin on a new and healthful frozen dairy product worked out by the dairy department of the station, and named lacto.

In the Eastern States the work of the stations continues to indicate the advisability and practicability of growing alfalfa in many sections. Last year the New Jersey Station's alfalfa field of 10 acres, seeded the year before, produced a total of 60 tons of hay. The New York Cornell Station in studying the relation of lime to the growth of this crop found that the protein content of alfalfa grown on lime soil is markedly greater than that of plants grown on soil in need of lime. In the particular experiments the difference amounted to 88 pounds of protein per ton of alfalfa hay. It was also observed that the growth of alfalfa increased the nitrifying power of the soil for at least certain periods in the growth of the crop.

The Nebraska Station, in studies of the water requirements of plants by a new method perfected by the station, has found in two dry years that there was a distinct economy of water with narrow-leaved corn as compared with broad-leaved. The strains with a high leaf area yielded 43.6 bushels per acre, while those with a low leaf area produced 52.1 bushels. The Delaware Station states that a fall growth of crimson clover may furnish 50 to 100 pounds of nitrogen per acre and be profitable even though the crop is winter-killed, and that the first month's growth in the spring usually produced about one-third of the total yield of nitrogen. It was determined that when the crop was removed 35 to 40 per cent of the nitrogen was left in stubble and roots.

The New Jersey Station has worked out a bacteriological method of determining the availability of nitrogenous fertilizers which promises to be of great practical value. It is based upon the rapidity with which the nitrogen of such fertilizers is converted into ammonia by bacteria.

THE AGRICULTURAL COLLEGES AND SCHOOLS.

The promotion of agricultural education has become a world-wide movement. There is now scarcely a civilized country in which no provision is made for specific practical instruction in agriculture, and wherever governments are establishing universities they are pro-

viding as liberally for colleges of agriculture as for those of the liberal arts and the professions. In this country many of the State universities are indebted largely to their colleges of agriculture for their present liberal support and large attendance of students, and some of them have actually grown within a few years from small land-grant colleges to large State universities.

The past year has been one of the best in the history of the American agricultural colleges. They have had more liberal appropriations from their respective legislatures and a larger attendance of students than ever before, and more of them have made provision for reaching the farmer and his wife and children upon the farm through the establishment of extension departments and the maintenance of training courses in agriculture for public-school teachers. Such courses were maintained in at least 46 of the agricultural colleges, and in 22 of them regular four-year courses for teachers were offered.

The success of the agricultural colleges and their efforts for the development of other educational agencies for the farmer have resulted in the very rapid growth recently of secondary schools of agriculture and of departments of agricultural instruction in public high schools. Several of the States have established complete systems of agricultural high schools, while others have adopted the policy of giving bonuses to existing high schools to encourage the establishment and proper support of agricultural instruction. During the year the legislatures in Maryland, New York, North Carolina, and Wisconsin passed laws providing for State aid for such high-school departments, and Minnesota and Virginia increased the amount of money available for such purposes. Minnesota now provides \$2,500 for each of 30 high-school departments of agriculture, home economics, and manual training, and \$1,000 for each of 50 other such departments. There are 10 States that give aid for high-school departments of agriculture.

In an advisory capacity this department is aiding the State authorities in the promotion of agricultural education by maintaining in the Office of Experiment Stations a small agricultural education service, which studies the various systems of agricultural education, investigates methods of teaching agriculture, prepares publications for teachers and others interested in promoting the educational efficiency of the people living in the country, brings the large amounts of new information on agricultural subjects published by the department and the experiment stations to the attention of teachers and students, and in general acts as a clearing house for agricultural education in this country. In this way 22 different States were given special assistance during the year.

FARMERS' INSTITUTES.

The work of the department in aid of farmers' institutes has continued under the direction of the Office of Experiment Stations. The reports of the several States show that during the year 5,712 regular institutes were held, consisting of 16,578 half-day and evening sessions, with an attendance of 2,094,155. Special institutes, movable schools, railroad specials, and other forms of agricultural extension had an attendance of 1,323,793, making the total attendance upon all forms of institute activity 3,417,948, an increase of 484,704 over that of the previous year.

THE DEPARTMENT'S INSULAR AGRICULTURAL EXPERIMENT STATIONS.

An eminently successful year has been reported by the stations maintained by the department in Alaska, Hawaii, Porto Rico, and Guam. The energies of these stations continue to be directed toward the diversification and improvement of the agriculture of their respective regions. These represent the widest extremes of agricultural conditions, from the arctic agriculture of Alaska to the tropical conditions of Hawaii, Porto Rico, and Guam, and present agricultural possibilities of the greatest diversity. That these stations are growing in the esteem and confidence of the people for whom they are maintained is shown by the rapid growth in correspondence, in the demand for publications, and in individual requests for advice as well as in the readiness to engage in cooperative work of all sorts and the increasingly generous private and community contributions of funds. The scientific work of these stations is attracting wide attention; their publications are noted in the principal scientific review journals of the world, and in not a few instances have been republished in foreign countries.

Through local contributions several additions have been made to the cooperative demonstration farms maintained by some of the stations. These farms will furnish the means of demonstrating the more practical results of the stations' work, while the more technical experiments are carried out at the station proper.

THE ALASKA STATIONS.

The work at the agricultural experiment stations in Alaska has been carried out during the year in accordance with the plans outlined in former reports. At Sitka horticultural and plant-breeding work is given prominence. At Rampart the principal work is in testing and breeding varieties of grain and in experiments with potatoes and hardy leguminous plants. Farming on a commercial scale as it must be practiced by settlers is carried on at Fairbanks, and at Kodiak breeding and care of live stock are the principal in-

vestigations. For the present this work is confined to cattle and sheep. The work with hybrid strawberries at Sitka has been continued with marked success and this station continues to propagate and distribute for trial a large number of fruit trees and bushes, and some ornamental plants. Comparative tests of about 60 varieties of potatoes, and of many varieties of cabbage, cauliflower, and other vegetables are being continued at the Sitka station to determine which varieties are best adapted to the climatic conditions of the coast region.

At the Rampart Station efforts to grow barley and oats have been uniformly successful and a number of crosses of varieties of barley have been made, some of which appear to have desirable qualities. Most of the spring-sown grains matured their crops this year. Some of the winter grains were partially destroyed by hard freezing before the ground was covered with snow. Potatoes have also been grown with success at this station. At the Fairbanks Station an attempt is being made to grow grain, hay, and potatoes on a commercial scale, but up to the present the principal energies have been expended in extending the area of cultivable land, about 70 acres being now under the plow. In 1910, in spite of injury to the plants by frost, several hundred bushels of potatoes were produced, of which \$1,500 worth was sold. At the Kodiak Station, which is devoted mainly to animal production, 82 head of purebred Galloway cattle of all ages, 10 grade cattle, and 89 sheep and lambs were successfully wintered on native forage supplemented by a small amount of purchased grain feed, and there does not appear to be any reason why stock raising should not be made a success in the coast region of Alaska, if care is exercised in selecting the stock and keeping it well housed and fed during the winter.

THE HAWAII STATION.

At the Hawaii Station the investigations outlined in previous reports have been continued and a number of new lines of work have been begun. The work with cotton continues to attract favorable attention, and it would seem that the profitableness of this new agricultural industry has been demonstrated. The Japanese rices imported by the station have been successfully grown, and samples submitted to rice consumers have been pronounced equal in quality to the imported Japanese rice. The importance of this fact is apparent when it is known that one-half to 1 cent per pound more is paid for Japanese than for other rice. Fertilizer experiments with rice and taro have given results which show how important improvements may be made in the methods of fertilizing these crops. In continuation of the work with pineapples, it has been shown that the chief difficulties with this crop are due to a lack of drainage and in

certain restricted localities to too much manganese in the soils. It has also been found that pineapples can be profitably grown in Hawaii with less rainfall than has hitherto been thought necessary. Experiments with broom corn at the station were so successful that this crop is being planted to some extent and a broom factory has been established in Honolulu. The station has carried on a number of experiments with various tropical fruits, and among other things has worked out a very successful budding method for avocados, has demonstrated the possibility of the orchard production of the papaya, and has aroused interest in improved methods of banana culture. In view of the shortage of forage in the islands the station is encouraging the culture of forage plants, especially with reference to ranch conditions. During the year the station established with Territorial funds 3 demonstration farms, 1 on Kauai and 2 on Hawaii. Similar farms are to be established elsewhere.

THE PORTO RICO STATION.

The Porto Rico Station has made substantial progress during the year both in equipment and in lines of work, and there is evidence that the relations of the station with the people of Porto Rico are most satisfactory. In accordance with the terms of the last appropriation act, coffee investigations were made a more extensive part of the station work during the year. The introduction of the higher-priced coffees into Porto Rican culture has been continued and some of the Java varieties are coming into bearing. Some 3-year-old trees have borne at the rate of 800 pounds merchantable coffee per acre, while the average of the island is only about 200 pounds per acre. Considerable attention has also been given to the study of the means of control of various insects and diseases to which the coffee plant is subject. The horticultural work of the station was considerably extended and included investigations on grafting stocks, fertilizers, and cover crops for citrus fruits. Especial attention was given to the introduction and propagation of the better varieties of mangoes, more than 40 varieties having been introduced from various tropical countries. The work in animal husbandry was also broadened and now includes horse breeding to improve the size and conformation of the horse, breeding for work oxen and dairy cattle, as well as the introduction and breeding of hogs, sheep, and poultry. Preliminary investigations on the production of forage have been begun, and a variety of sorghum introduced from Barbados has given heavy yields on dry, hilly lands. The work in making and feeding silage was continued, and it appears that good silage can be made with less difficulty in Porto Rico than in a temperate climate. An investigation showing that chlorosis in pineapples, which prevails in the

island, is due to an excess of carbonate of lime in the soil was completed during the year. This work furnishes a valuable basis for the selection of soils for pineapples.

THE GUAM STATION.

Although much of the work done at the Guam Station during the year was of a preliminary character, such as the construction of new buildings, building of roads, clearing and draining of lands, etc., various field operations were also successfully carried on. The leading work of this station continues to be the production of feed and forage preliminary to experiments on the improvement of the live stock of the island and includes experiments with corn, various grasses, and leguminous forage plants. The experiments have demonstrated the superior value of Para grass, *Paspalum dilatatum*, Guinea grass, and several nonsaccharin sorghums as forage plants. Of the leguminous plants under observation, the pigeon pea, jack bean, and common peanut have given promise of success. Much work was carried on with vegetables, in many cases with very promising results. One of the most striking achievements of this station is the introduction of the Smooth Cayenne pineapple from Hawaii. Various other fruits besides a number of miscellaneous plants have been introduced and are being tested by the station. Plans have been perfected for undertaking experiments on the improvement of the live stock of the island, which is now of very low grade, and 6 head of Morgan horses, 5 of Ayrshire cattle, 4 Berkshire hogs, and some poultry were shipped to Guam by Government transport in September. There is a growing interest in the work of the station, which has been greatly promoted by the cordial cooperation of the local authorities.

DESIRABILITY OF ESTABLISHING STATION AT TUTUILA.

The attention of the department has been called by the naval Governor of Tutuila to the desirability of establishing an agricultural experiment station on that island. This and the adjoining Manua Islands of the Samoan group came into the possession of the United States in 1899. The people are mainly engaged in agriculture, copra, the dried flesh of the coconut, being their only marketable product. The coconut beetle, a very destructive pest, is said to be present on neighboring islands, and its appearance on Tutuila would probably be followed by the destruction of the copra industry so far as that island is concerned. The establishment of an experiment station with men trained along the lines of modern agriculture would aid materially in preventing its introduction and also would demonstrate the advantages of more diversified agriculture.

IRRIGATION INVESTIGATIONS.

The Office of Experiment Stations has maintained its former lines of irrigation investigations with such modifications as have been necessary to best meet the changing conditions and the new problems. The work has been conducted chiefly along three lines: (1) Investigations and experiments to ascertain better methods of applying water and of preventing wastes through seepage, evaporation, and overapplication, to determine the effects of irrigation upon the yield and quality of crops, and to obtain data as to power and pumping; (2) the collection of data and publication of bulletins and circulars on methods of applying water to different crops, the irrigation possibilities and conditions in different sections of the arid West, and pumping; (3) the furnishing of prospective settlers with information concerning different localities and advising new and old settlers in irrigated sections in regard to the methods best adapted to their individual needs and how best to use their water supplies. This last line of work has occupied the greater part of the time of the 10 agents of this office detailed to have charge of the work in the various Western States and Territories.

The investigations and experiments regarding seepage from canals, evaporation from irrigated soils, and the most economical amount of water to use on different crops in different localities have all been continued and have had a noteworthy effect in reducing the losses of water due to the wasteful methods too commonly practiced. The demonstration farms at Davis, Cal.; Gooding, Idaho; Cheyenne and Newcastle, Wyo., and Eads, Colo., have also exerted a great influence by giving irrigators of those sections actual demonstrations of the best methods of applying water.

DRAINAGE INVESTIGATIONS.

Among the most important drainage investigations of the year have been those pertaining to the reclamation of tidal marshes. The growing population and the scarcity of good upland farms, particularly in the Atlantic Coast States, have caused search to be made for any uncultivated lands that could be made profitable for agriculture. It is not surprising, in view of the richness of European lands reclaimed from the sea, that attention early turned toward the salt marshes. On account of the interest aroused in this work, a thorough investigation has been made by this office. Four large tracts of drained tidal marsh on the Delaware River have been minutely studied, with the view of determining the kind of marsh lands that might be profitably reclaimed, the special requirements of the protective and drainage works, the causes of past failures, the

treatment of the soil to fit it for dry-land crops, the kind of crops best suited to newly reclaimed marshes, the cost of reclamation, and the profitableness of the reclamation. Very full data were obtained on nearly all these points. The investigations along the Delaware River were supplemented by examinations of reclaimed lands on the coast of New England, Nova Scotia, and New Brunswick.

NUTRITION INVESTIGATIONS.

In continuing studies of the nutritive value of animal and vegetable products used as food, attention has been directed particularly to two lines of work, namely, the use of cheese and other materials as possible substitutes for meat in the diet, and the adaptation of the respiration calorimeter to studies of physiological changes in vegetable products, particularly with reference to the changes which bananas undergo during the active ripening period.

The work with cheese and other meat substitutes has involved respiration calorimeter experiments on the relative ease of digestion of cheese and meat, as well as more practical experiments, the general conclusion being that if a housekeeper so desires it is possible to prepare a well-balanced dietary in which cheese and other foods may be used wholly or in part in place of meat. The question has been discussed at length in an article in the Yearbook, while much related information on the use of cheese in the diet has been prepared for publication as a Farmers' Bulletin.

Particularly interesting is the adaptation of the respiration calorimeter to the study of problems of vegetable physiology, and the results obtained in a series of experiments carried on in cooperation with the Bureau of Chemistry on the respiration and energy output of bananas during the active ripening period. Not only have the results provided facts of great value in connection with studies of ripening fruit which the department is carrying on, as well as facts of theoretical interest, but they have also shown that the respiration calorimeter offers a new means for studying problems of vegetable physiology which are of great importance to the producer and shipper of agricultural products, the warehouseman, and those who store products in the home, as well as to the student interested in the study of technical questions.

OFFICE OF PUBLIC ROADS.

THE EVOLUTION OF THE ROAD PROBLEM.

The United States is in the midst of a national readjustment with regard to road improvement. The rapidly changing traffic conditions have necessitated equally radical departures from the old methods of road construction and maintenance. Methods which but a few years

ago were considered entirely satisfactory and firmly established, both in theory and practice, are now often found to be entirely inadequate. In road administration the old principle of extreme localization is fast giving way to new systems involving the principle of centralization and fixed responsibility. A great deal of careful scientific, as well as educational, work is needed in order to solve correctly the many difficult problems which have arisen in regard to the administration, construction, and maintenance of our public roads. This work should prove of the greatest value to the whole country.

OBJECT-LESSON AND EXPERIMENTAL ROADS.

The questions which confront road builders vary greatly with local conditions. Instruction in the art of road building to be of real practical value must be adapted to the peculiar conditions of each locality. Such instruction is given by the Office of Public Roads through the medium of object-lesson roads, built at local expense. During the past fiscal year roads were built in 52 places, involving an expenditure of approximately \$120,000 by the local authorities. The types of road construction included sand-clay, earth, gravel, oiled gravel, plain macadam, bituminous macadam, oil concrete, and slag asphalt. When it is considered that each of these 52 object-lesson roads constitutes a practical school of applied road building, it must be evident that this feature of the department's work is a powerful factor in the great Nation-wide movement for the betterment of our public roads.

ADVISORY WORK.

For the purpose of giving expert advice concerning specific problems in road work 183 special assignments covering 30 States were made. This work related to such varied subjects as construction of various types of road, surveys, use of prison labor in road work, bridge construction, road maintenance, use of the split-log drag, road materials, effect of automobiles on roads, issuance of bonds for road improvement, road drainage, and other work along similar lines. This is most positive evidence of the wide usefulness of this office, and shows also how generally local communities have come to look upon the Office of Public Roads as a body of consulting engineers and experts capable of offering effective and reliable advice concerning difficult and special problems which are not easily handled by the local authorities.

MODEL SYSTEMS.

Work under the project of model systems has shown a most wonderful increase during the year. Assistance along these lines has been given to 14 counties in 8 States, as against 3 counties in 1910. This is work of the most useful and permanent character. It in-

volves a thorough investigation of the entire road system of the county with regard to location, materials, systems of construction, maintenance, and administration. In fact, every feature bearing on the practical improvement and future maintenance of the roads of the county is considered, and a practical working scheme for the present as well as future betterment and maintenance is drawn up and given to the proper authorities.

LECTURES, ADDRESSES, AND PAPERS.

Lectures, addresses, and papers form an important part of the educational work of the Office of Public Roads, which has been greatly increased during the year. These lectures are in almost all cases given by the men who direct the investigative work and the construction and maintenance of the object-lesson roads, and are therefore of a practical and instructive character. During the year 723 lectures and addresses were given in 35 States, as compared with 523 for the previous year. These lectures had a total attendance of over 200,000, a large majority of whom were farmers.

INSTRUCTION IN HIGHWAY ENGINEERING.

The project for the instruction of engineer students in practical methods of road construction and maintenance has been enlarged and improved during the year. The plan provides for the appointment each year of graduate engineers to the position of civil-engineer student. The course of instruction covers one year, during which the student receives a most thorough training in all branches of the work. The Office of Public Roads is in constant receipt of requests from States, counties, and townships to recommend competent young engineers to take charge of road improvement. During the year 12 engineers, constituting a very considerable percentage of the total number, resigned to take up work in various parts of the country.

While the work of the office is to a certain extent handicapped by this constant drain, it is believed that the benefit derived by the country in general through the distribution of properly trained highway engineers in the various States and counties is so great as to vindicate the wisdom of this project. While the object-lesson work is an excellent example in any community, it lacks the living, dynamic force which the capable, progressive engineer exerts continually from year to year on the movement for better roads in all of its varied phases.

HIGHWAY BRIDGES AND CULVERTS.

During the year a bridge section has been established in the Office of Public Roads. The need for better culverts and bridges for our public highways is becoming evident from the point of view both of

economy and of safety. One of the peculiar difficulties encountered by the local communities with regard to bridges and culverts is that the great majority of these structures are comparatively small, so that those in responsible charge do not feel warranted in incurring the expense incident to the employment of skilled engineering assistance. Requests are continually being received for information concerning the use of concrete and other materials for bridges and culverts. Such information is being collected and disseminated. One bulletin dealing with this subject has already been published and others are in course of preparation. The published information is supplemented by personal inspection, advice, plans, and superintendence by the engineers of the office when request is made through the proper local authorities.

TESTING OF ROAD MATERIALS.

In the routine testing and examination of road materials great progress has been made along established lines. The total number of samples tested during the year was 685, which were received from a widely distributed area, including 42 States and Territories, Porto Rico, Canada, and Germany. During the year 324 samples, mostly bitumens, were received for examination in the chemical laboratories. This is nearly twice the number examined during the previous year, and more than four times the number examined in 1909. Much valuable work has also been done in standardizing methods of testing and examining road binders and other materials. It has been found that the addition of a small proportion of cement to blast-furnace slag screenings increases the cementing properties very greatly. These investigations will be continued both in laboratory studies and in service experiments in the field during the coming year. Research work in concrete has been carried on with increased vigor. These investigations include a study of oil-mixed cement concrete, principally with reference to its road-building and water-proofing properties, and also a study of the expansion and contraction of concrete while hardening, a subject of much importance in connection with concrete pavements.

INVESTIGATION OF ROAD BINDERS AND DUST PREVENTIVES.

Investigation of the problems of dust prevention and road preservation has occupied much attention during the year. Commendable progress has been made in the several lines of work. Demand for specifications covering the various types of bituminous binders and bituminous road construction is continually increasing. During the year 81 sets of specifications were furnished, on request, to officials in 20 different States, and also to the Reclamation Service, the Navy Department, and the War Department.

Many worthless road preparations have been and are still being manufactured and sold to the public through ignorance on the part of both the producer and consumer with regard to the characteristics of such materials requisite to meet local conditions. These materials are sold under trade names, and as a rule carry no valid guaranty of quality. Correct specifications for such materials are, therefore, much needed for the protection of the public.

The influence of the work already done by the office along these lines is shown in the production of better and more uniform materials on the part of the manufacturers.

While great progress has been made in the improvement of methods of bituminous road treatment and construction during recent years, the subject is still in a stage of development. For this reason the work carried on by the office is of the greatest value to the country in general. Tests and methods of analysis are being standardized, and the behavior of the various materials in actual use is being more definitely determined, while the development of economic and practical methods of construction suitable for various local conditions is being perfected. Much research work along these lines has also been carried on, and will be continued during the coming year. These cover such subjects as the effect of various methods of distillation on the physical and chemical properties of tars, investigations on the economic utilization of various coke-oven tars in the preparation of road binders, studies on the effect of light and the effect of weathering on various bituminous materials, and other allied subjects.

STATISTICAL AND ECONOMIC INVESTIGATIONS.

An investigation completed during the year shows that the total road mileage of the United States, exclusive of Alaska and insular possessions, is 2,210,857 miles, of which only 187,910 miles, or 8.49 per cent of all our roads, are improved. But in 1904 only 153,531 miles, or 7.13 per cent of our public roads, were improved. Thus in the five-year period 1904-1909 the increase in the mileage of our improved roads has been 34,379 miles. Investigations to ascertain the economic effect of road improvements on rural communities were begun in 1910 and carried on during the past year. These investigations give promise of exceedingly valuable data and will be continued during the coming year. Investigations dealing with road administration and road management have been inaugurated during the year. It is believed that when these investigations are completed and published they will result in the complete reorganization of the present system of road administration in many communities throughout the country. Information is also being collected in regard to taxation, bond issues, and the use of convict labor in road building. This work will be continued during the present year.

EXHIBITS AND ROAD-IMPROVEMENT TRAINS.

Another important feature of the educational work of the office during the year was the road exhibits displayed at Knoxville, Tenn., during the Appalachian Exposition, and also at Chicago, Ill., during the National Land and Irrigation Exposition. These exhibits attracted so much attention at these expositions that various railroad companies applied to the office for the privilege of installing them on cars where they could be shown at the principal towns along their lines. An arrangement was accordingly made with the Pennsylvania Railroad, the State Highway Department of Pennsylvania, and the Pennsylvania State College to cooperate with the office in operating a road-improvement train throughout the State of Pennsylvania. The train carried an exhibit car, which contained not only the models referred to above, but also a large number of enlarged photographs and pictures illustrating various features of the road subject, together with a lecture car, in which illustrated lectures were given at each stopping place. Two other cars were provided with exhibits of modern road-building machinery. Another similar train was started May 1, 1911, over the lines of the Southern Railway. The success of this project is shown by the fact that during the year approximately 65,000 people attended the lectures and viewed the exhibits. This work will be continued along similar lines during the coming year.

OIL-MIXED CEMENT CONCRETE.

A very important discovery, that of oil-mixed cement concrete, was made during the fiscal year 1910. Laboratory and service investigations show that the Portland cement concrete of everyday use may be rendered waterproof at very slight extra cost simply by the addition of residual mineral oil. The possibilities for an increased and more efficient usefulness of concrete by the application of this method of damp-proofing are manifestly numerous.

A public patent, which has aroused much interest throughout the country, has been granted to Mr. L. W. Page, Director of the Office of Public Roads, for mixing oil with Portland cement concrete and hydraulic cements giving an alkaline reaction, so that anyone may use this process without the payment of royalties.

The crop year 1911 has been one of extremes. Light rainfall and high temperatures reduced the magnitude of many of our crops, and this reduction increased the price. The cotton crop was above the average and its price declined heavily.

The study of agriculture is progressing along scientific and practical lines and the work done indicates better mental equipment.

While the total values of crops in 1911 are not so high as in 1910, there is great abundance for all purposes. I am gratified to see the beet-sugar tonnage reach nearly the 600,000 figure. It indicates that we can make our sugar. We still buy nearly \$100,000,000 worth of sweetening.

The details of the operations of the department will be found in the reports of the heads of the several bureaus, divisions, and offices.

Respectfully submitted.

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *November 25, 1911.*

REPORTS OF CHIEFS.

REPORT OF THE CHIEF OF THE WEATHER BUREAU.

UNITED STATES DEPARTMENT OF AGRICULTURE,
CENTRAL OFFICE OF THE WEATHER BUREAU,
Washington, D. C., October 1, 1911.

SIR: I have the honor to submit a report of the operations of the Weather Bureau during the fiscal year ended June 30, 1911.

WILLIS L. MOORE,
Chief of Weather Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

MOUNT WEATHER RESEARCH OBSERVATORY.

The work of the observatory has been carried on along practically the same lines as for the previous year; at this time it is chiefly concerned with the investigation of the upper air over the United States. The work under this head may be divided into three separate branches, as follows:

1. Soundings of the upper air over Mount Weather, Va., by means of kites and captive balloons.

2. Soundings of the air at great altitudes by means of free balloons carrying meteorological instruments. While all preliminary testing and the later computing in this branch of the work are carried on at Mount Weather, the actual ascensions are made in the West, since the proximity of Mount Weather to the Atlantic Ocean on the east makes it inadvisable to send up free balloons from that point. The immediate supervision of all of the work enumerated under headings 1 and 2 is assigned to Research Director William R. Blair.

3. Study of the temperature and pressure changes in the lower layers of the air by means of summit and base stations in the mountains of Colorado.

PROGRESS IN AERIAL INVESTIGATIONS.

Considering first the aerial work at Mount Weather, it may be remarked that four years of nearly continuous kite or balloon records have been secured and published. During the fiscal year just ended 299 soundings were made by kites and 69 by captive balloons. The average altitude attained by the kites was 2,929 meters (9,609 feet); by captive balloons, 2,150 meters (7,054 feet) above sea level. Mount Weather itself is 525 meters (1,725 feet) above sea level. The number of kite flights in which an altitude of a mile above the mountain top (2,134 meters above sea level) was reached during the year was 250; 2 miles, 85. In but 10 flights was an altitude of 3

miles reached or exceeded. The mechanical equipment used in kite flying has been brought to a high state of perfection, as evidenced by the few "breakaways" of the kites during the year, but a kite meteorograph satisfactory in all respects remains to be constructed.

The classification and compilation of the Mount Weather kite and balloon data necessary in order to study the information secured under different weather conditions have been a part of the office work during the year, and a summary of the mean results for three years has been prepared and is now in the hands of the printer. It will appear as part 2, Volume IV, of the Mount Weather Bulletin.

A most important piece of work was accomplished by the Mount Weather Observatory during the year in the completion of two sounding-balloon campaigns, the first at Huron, S. Dak., and the second at Fort Omaha, Nebr. Some account of the earlier work in this direction was given in my last annual report. In order to present the subject intelligently, I shall repeat some of the facts given in previous reports.

The use of small free balloons to carry meteorological instruments into the upper regions of the atmosphere dates from 1893, nearly 20 years ago, when Messrs. Hermite and Besançon in France sent up varnished paper balloons carrying registering instruments which brought back a record of the meteorological conditions encountered in the ascension. To Assman, of Germany, however, is due the substitution of small rubber balloons in these ascents. The expansion of the confined gas at great altitudes bursts the balloon, the landing of the instrument being effected by means of a light parachute with which the balloon is covered.

The first series of sounding-balloon ascents in the United States was made at St. Louis, Mo., in the years 1904 to 1907, inclusive, under the direction of Prof. A. Lawrence Rotch, of Blue Hill Observatory. Prof. Rotch conducted 77 ascensions, the instruments being recovered in all but 5 cases. Thirty-seven of the ascensions reached an altitude of 10,000 meters (6 miles) or greater. In the series by Prof. Rotch heights exceeding 10 miles (16 kilometers) were attained 5 times. The Mount Weather Observatory has sent up 91 sounding balloons, of which number 81 were recovered. Heights exceeding 10 miles were attained in 37 cases, the greatest height attained being 18.9 miles at Huron, S. Dak., on September 1, 1910.

The exploration of the atmosphere by means of sounding balloons has become an international work and is carried on through an international commission of which Prof. H. Hergesell, of Strassburg, is president. Through this commission are collected and published the results of aerial observations made quite generally at appointed times by all meteorological services in the Northern Hemisphere. The most important single result that has come from the observations is the discovery of a region in the atmosphere, about 7 miles above the earth's surface, where the fall in temperature with increasing altitude ceases. On the contrary, there may be a slight rise in temperature on entrance to this region. Although various names have been assigned to this region, none fully describes its characteristics. In this report it will be referred to as the "upper inversion." Inversions of temperature are frequently found in the atmosphere next to the earth, but they are generally small in amount and fleeting in character. The upper inversion, however, appears to be a world-wide

phenomenon. It was discovered in northern Europe, and its presence has since been established in the United States, within the Arctic Circle, north of Europe, over tropical Africa and the Indian Ocean, and in Java.

The matter which follows is largely taken from a preliminary report on the data secured by sounding-balloon ascensions in the United States. The full report will be published in the Mount Weather Bulletin, Volume IV, probably in part 3, which will be sent to press in August, 1911. The statements refer to the most obvious facts ascertained by the balloon ascensions.

The original plan of sounding-balloon ascensions in this country contemplated simultaneous ascents from two points on an east and west line. Notwithstanding the great area of the United States, regions adapted to the work are remarkably few, outside of the Western Plains and the Central Mississippi Valley. Fort Omaha, Nebr., was selected as the western station largely because of the presence there of a detachment of the United States Signal Corps, which maintains a hydrogen-gas plant. The thanks of the bureau are due to Gen. James Allen, Chief Signal Officer, and the local officials at Fort Omaha, for many courtesies shown while operations were conducted at that point. Indianapolis, Ind., was selected as the eastern station. The board of public parks of that city kindly placed at our disposal ground in the park system on which to conduct the ascensions. For various reasons the number of ascensions at this place was less than at Fort Omaha, but all of the balloon meteorographs sent up were eventually found and returned to Mount Weather.

The second and fourth series of ascensions were made at Fort Omaha, Nebr. In the second Omaha series the balloons used had been on hand about six months and the rubber had so deteriorated during that time that heights much above 6,000 meters (3.7 miles) were not attained.

The third series was made at Huron, S. Dak. The advantages of the latter station lie in its geographic position, being farther north, and thus more directly in the path of cyclonic and anticyclonic areas. A successful series of ascensions was made from the State fair grounds at Huron, 24 of the 26 instruments sent up being recovered.

During the fourth and last series of ascensions, at Fort Omaha, from February 8 to March 4, 1911, inclusive, 25 meteorographs were sent up, of which 22 were found and returned. This was also an excellent series, but unfortunately no well-marked cyclonic areas passed over Fort Omaha during the three weeks the party was there.

Naturally the first thought in connection with the upper inversion is its relation to terrestrial weather conditions. Thus far ideas on the subject are quite hazy, but certain facts have been established, as follows: The lowest temperatures of the upper inversion are found in equatorial regions and the highest in the middle latitudes. In other words, temperature increases with increase of latitude, contrary to the rule which prevails on the earth's surface. In tropical Africa, Berson, of the German expedition, found a temperature of -83.9° C. (-119° F.) at an altitude of 19 kilometers (11.8 miles).¹ At the same elevation in the United States the temperatures range

¹ Later ascensions made at Java, Batavia, confirm the existence of low temperatures over equatorial regions. See van Bemmelen in *Met. Zeit.*, May, 1911.

between -55° and -60° C. (-67° to -76° F.). The discovery of the low temperatures aloft over the equator serves to increase, rather than diminish, the complexities involved in the accepted theories of the general circulation of the atmosphere. Another fact of great interest in connection with the upper inversion is that its temperature, while practically constant from season to season, varies greatly from place to place and from day to day. In the United States the mean of 50 ascensions made under the direction of the Mount Weather Observatory, all of which entered the region, gives for the lower limit of the upper inversion a temperature of -52.1° C. (-61.8° F.) regardless of season. The mean temperature of the lower limit of the upper inversion, as deduced from the ascensions made under the direction of Prof. Rotch at St. Louis, Mo., for all seasons is -56.0° C. (-68.8° F.). The lower temperatures registered over St. Louis may be due in part to the latitude effect. The mean temperature of the upper inversion in Europe is not far from -55° C. (-67° F.).

It is said that in Europe the beginning of the upper inversion is found at a less altitude over cyclonic than over anticyclonic areas; also that it is higher in summer than in winter. In this country the lower limit of the upper inversion does not appear to be at a less altitude in cyclonic than in anticyclonic areas, although the evidence is not absolutely conclusive either way. In the Huron series the upper inversion was reached at an altitude as low as 9,328 meters (5.8 miles) on the front of an anticyclone. It was also reached at the low elevation of 9,712 meters (6 miles) in the transition region between a cyclone and an anticyclone, and at an altitude of 9,372 meters (5.8 miles) in a cyclone, while on other occasions in cyclones it has been reached at altitudes ranging from 10,000 to 14,000 meters (6 to 8.7 miles). The greatest altitude at which it was encountered, 14,983 meters (9.3 miles), on September 28, 1909, was not in an anticyclone, but in the transition region between a northern cyclone and a southern anticyclone.

In the United States the seasonal distribution of the ascensions has not been so good as might be wished. If the year be divided into two portions, the warmer half, or from April to October, inclusive, and the colder half, from November to March, inclusive, the following results are obtained for the average height of the lower limit of the upper inversion:

	Meters.
Rotch, warmer half, 19 ascensions.....	11,986
Weather Bureau, warmer half, 29 ascensions.....	11,308
Rotch, colder half, 5 ascensions.....	11,192
Weather Bureau, colder half, 21 ascensions.....	11,082

Thus it is seen that the lower limit of the upper inversion in the United States is found at a slightly less altitude in winter than in summer, agreeing in the main with European observations. The winter series of 21 ascensions was made from February 8 to March 4, inclusive. The summer series was made mostly in September and October.

By reason of the clear skies and relatively dry air of South Dakota and other western States it was possible to make observations on the motions of the balloons after they had gotten well into the region of the upper inversion, and thus to obtain some interesting facts con-

cerning the movement of the atmosphere in that region. It is apparent at the outset that the lower limit of the upper inversion is not sharply defined, but that the air motion in the explored part of that region, at least, partakes of, and probably is controlled by, that of the lower levels of the atmosphere on which it rests. The observations of the wind velocity in the region of the upper inversion were not conclusive in any respect, other than that the movement was at times considerable, and again of rather low value, as on September 7, 1910, when, at Huron, S. Dak., winds at 3 to 11 kilometers altitude (1.9 to 6.9 miles) averaged about 16 meters per second (36 miles per hour). At the base of the upper inversion a wind of 18 meters per second (40 miles per hour) was encountered; at 1,000 meters (3,280 feet) higher, the wind had increased to 32.5 meters per second (73 miles per hour). It continued at a high velocity up to 17,227 meters (10.7 miles) and then suddenly fell off to 6.8 meters per second (15 miles per hour). On another occasion, September 4, 1910, the enormous velocity of 42.2 meters per second (95 miles per hour) was found at the base of the upper inversion, and a still higher velocity of 48.5 meters per second (108 miles per hour) was encountered somewhat higher. Above this, however, the speed of the wind diminished to zero. The ascension of the 4th was in a cyclonic area, while that of the 7th was on the front of a strong anticyclone moving toward Huron from the British northwest.

Another interesting conclusion that may be drawn from the sounding-balloon ascensions, and also from observations on high mountain stations, is that the gyratory motion of the air characteristic of cyclones at the surface and for some distance above, does not extend far upward.¹ The movement of the upper layers, say above 10,000 meters (about 6 miles), as indicated from the drift of balloons that ascended to that altitude, appears to be in three main directions, viz, from west to east under normal conditions; from north to south, or northwest to southeast, when anticyclones dominate the weather; and from south to north, or southwest to northeast, when cyclones control the weather. Perhaps a better way of expressing the idea would be to say that the air currents are from some northerly direction on the east side of anticyclones and from some southerly direction on the west side, and that under practically all other conditions the drift of the air in the very high levels is from west to east.

One of the interesting facts brought out in connection with ascensions in anticyclonic conditions is that the prevailing west winds of the middle latitudes, formerly believed to extend in an unbroken stratum from an altitude of about 5 kilometers (3.1 miles) to at least 16 kilometers (10 miles), are at times wholly suspended up to an altitude of 12 kilometers (7.5 miles). This fact is confirmed by observations made on Pike's Peak, Colo., as will be referred to later.

In 39 ascensions made under the direction of Prof. Rotch, in which the altitude reached was 6 miles or over, 11 balloons landed almost due east of their starting point, 22 landed south-southeast of their starting point, and 6 landed north-northeast of their starting point. It is not always, nor in the majority of cases, possible to tell from surface conditions the direction the balloon will take. Sometimes,

¹ Bigelow reached the same conclusion from a study of cloud observations. See Report Chief of Weather Bureau, 1898-1899, p. 434.

however, there is fair agreement between surface pressures and upper wind drift. In general there is a northerly component in the winds in front and on the east side of an anticyclone, although numerous exceptions to this rule have been noted. One of the most marked exceptions was on November 25, 1901, when a balloon launched at St. Louis, Mo., traveled almost due east to near Louisville, Ky., although the pressure distribution at the surface clearly indicated northerly winds, and winds from that direction actually prevailed at the ground. This balloon, which reached an altitude of 11,500 meters (7.1 miles), and the one sent up the following day, moved with the enormous average velocity of 100 miles per hour. The second balloon, instead of moving toward the east, as did the one launched on the previous day, moved in a south-southeast direction and landed in western Tennessee. From this change in direction of the air currents it is evident that some temporary disturbance occurred in the atmosphere sufficient to modify greatly the eastward flow. What the disturbance was is not apparent from surface conditions. On the day that the balloon moved eastward there was a marked barometric depression over southern New England which had been stationary for about 24 hours. It may have been that the pressure in the higher levels over New England was falling on the day in question, and that the high eastward velocities encountered by the balloon were due to a pressure gradient that existed in the upper regions only. Hann showed more than 20 years ago that atmospheric pressure on mountain tops continues to fall for some time after the turn to rising pressure has set in over surrounding low levels.

The cause of the changes in the direction of the wind aloft is not always apparent from surface distribution of temperature and pressure. Primarily, the direction of the wind on the earth's surface is dependent on the temperature and pressure, the winds blowing from regions of low to regions of high temperature and from regions of high to regions of low pressure. In the United States the strong winds of winter have regions of higher temperature on their right and in slightly higher latitudes. Unfortunately we are not able to study the temperature changes in the atmosphere as a whole, but only in a thin stratum next to the earth's surface. The upper winds in the United States are uniformly from the west, as has been fully demonstrated in the past. That these prevailing westerly winds are subject to important modifications is shown by the motion of the upper clouds and by the travel of sounding balloons.

Sounding-balloon ascensions have added very much to our knowledge of the temperature of the atmosphere up to heights of 15,000 meters (9.3 miles) and even higher, but the number of ascensions to heights above 9.3 miles is as yet small.

The vertical distribution of temperature in different sections of the same anticyclone is well shown by the simultaneous ascensions at Omaha, Nebr., and Indianapolis, Ind., on October 5, 1909. The two stations were, roughly speaking, within the influence of a great anticyclone, Indianapolis being nearest the center and under the higher pressure. The pressure at Indianapolis being higher than that at Omaha, we should expect lower surface temperature, as was actually found. But the low temperature of the air column over Indianapolis extended up to 2 km. (1.2 miles) only, at which level the air-column temperatures at the two places were reversed, the western station

becoming the colder at that level, and steadily remaining so up to 14 km. (8.7 miles). During an earlier ascension at the two stations, on September 30, 1909, the surface weather conditions were quite different from those of October 5, the two stations being separated by a shallow anticyclone, with Indianapolis on the eastern edge and Omaha on the western edge. As in the first-named case, the eastern station was the colder up to about 3 km. (1.9 miles), but from that altitude up to about 12 km. (7.5 miles) the Omaha air column was the colder, the difference at the 12 km. level amounting to 16°C . (28.8°F). Marked variations of the temperature at similar great altitudes have been recorded elsewhere, especially in England, where the temperature of the lower limit of the upper inversion has been found to differ on the same day as much as 20°C . (36°F .) at stations not more than 150 miles apart. The lowest temperature recorded in any of the Weather Bureau series of ascensions was -68.9°C . (-92°F .) at Huron, S. Dak., in September, 1910.

A study of observations at mountain stations in Colorado has shown that variations of temperature at the summit and at the base stations are nearly coincident in point of time and are generally similarly directed, but that there are occasions when a fall in temperature sets in on the plains while the temperature on the mountain tops is still rising. In rare cases, also, the weather conditions on the mountain summits are controlled by causes that are not operative on the plains to the eastward. These studies have increased our knowledge of the effect of local topography in the warming and cooling of the air that is trapped between the mountain ranges. The important fact, revealed in connection with sounding-balloon ascensions, that the prevailing eastward drift of the atmosphere is wholly suspended during the prevalence of strong anticyclones is confirmed by a study of the records of wind movement over the high stations of eastern Colorado at Corona and Pikes Peak. There can be no doubt that the local circulation in strong anticyclones up to the level of Pikes Peak is controlled by the anticyclone, though this is seemingly controverted by observations on the movement of high clouds in other parts of the United States.

The cirrus level in the United States is about 15 km. (9.3 miles) above sea level. Clouds in this level have been observed to move directly across the central areas of anticyclones, from west to east, which movement would not be possible did an easterly current prevail at that level. The wind movement over Pikes Peak, Colo., 4,301 meters (14,111 feet) above sea level, is from the northeast when an anticyclone occupies the Great Basin to the westward, thus indicating the local control of the wind circulation by anticyclones at the level of Pikes Peak.

At Mount Weather, Va., the kite flights thus far made show that practically all easterly winds, except under special conditions, are shallow winds; that is, they are generally less than a mile in vertical extent.

SOLAR RADIATION.

Between July 16 and October 10, 1910, Prof. Kimball was engaged in a pyrheliometric survey of the region west of the Great Lakes and the Mississippi River, preliminary to the establishment of permanent

observing stations. One of these, Madison, Wis., has been in operation since July 22, 1910, and others will be equipped as soon as apparatus already ordered is received. Pyrheliometric observations have been maintained throughout the year at Washington, D. C., and were resumed at Mount Weather in May.

The observations at the western stations showed radiation intensities in excess of the five-year averages for Washington, the excess ranging from 4 per cent in August, at Lincoln, Nebr., to 22 per cent in September, at Flagstaff, Ariz.

The most striking features of the year have been the high value of the radiation in February and March on the front of marked high barometric areas, and the low value during the protracted hot wave in May. At Madison, on February 23, and again on March 4, the radiation intensity with the sun shining through an air mass 1.5 (zenith distance of the sun 48°) was 1.67 calories per square centimeter per minute, which is as high as any measurement obtained by the Smithsonian Institution on Mount Wilson during the summers of 1905 and 1906. At Washington the corresponding maximum intensity during this period was 1.47 calories, or 12 per cent less than at Madison.

During the hot wave of May, 1911, the maximum intensity of solar radiation measured at Mount Weather, with the sun at zenith distance of 48° , was 1.20 calories per square centimeter per minute, and the average was little over 1.00 calorie.

Measurements of the polarization of skylight, as well as other considerations, indicate that during protracted hot periods a very considerable percentage of the heat reaching the lower layers of the atmosphere is received diffusely from the sky. A Callendar recording pyrheliometer, capable of measuring the heat thus received, has been in continuous operation at Washington throughout the year; but quantitative results can not be given until this instrument has been carefully compared with a Marvin pyrheliometer, which will be done as soon as a new Callendar instrument provided with an improved form of recorder is received.

In response to the request of certain European investigators, a series of special observations on the positions of the neutral points of Arago and Babinet was made by Prof. Kimball while on field duty. These are now being continued at Mount Weather in connection with the measurements of the percentage of polarization of skylight, made as in previous years.

The five-year averages of solar radiation intensities for Washington were published in the Bulletin of the Mount Weather Observatory, Volume III, part 2. In response to a special request, a résumé of that part of the above paper which treats of sky polarization, together with a summary of the polarization observations obtained while on field duty, was prepared by Prof. Kimball for publication in the Journal of the Franklin Institute for April, 1911.

The constants to equation 20, Bulletin of the Mount Weather Observatory, Volume I, part 4, are being recomputed from data recently furnished by the Smithsonian Institution. Prof. Humphrey's recent computation of the distribution of aqueous vapor in the atmosphere when the sky is cloudless will also be utilized. New tables for facilitating solar constant computations will be prepared from this revised

equation. A copy of these tables has already been requested by the Argentina Meteorological Office.

It is believed that accurate determination of the intensity of direct solar radiation, of the quantity of heat received diffusely from the whole sky, and of the rate at which heat is lost at night will not only be of value to climatologists generally, but will also be utilized by the weather forecaster. Especially urgent is the demand from biologists for accurate data relative to the quantity of heat received from the whole sky. The University of Wisconsin is now furnishing data of this character for use in connection with certain biological studies.

MOUNT WEATHER BULLETIN.

A full discussion of the upper-air observations made at Mount Weather and elsewhere, as well as of the progress made in other special lines of scientific work, will be found in the successive issues of the Bulletin of the Mount Weather Observatory, which, it may be remembered, is devoted to the results obtained from aerial investigations as well as from other special researches into obscure laws of atmospheric phenomena bearing on the physics and mechanics of the whole atmosphere. Although this publication is mostly filled by the results contributed by the staff of the observatory, yet, when space allows it, contributions of fundamental importance presented by other meteorologists are included in the Bulletin.

The completed Volume II, with its index, was issued in July, 1910, and the completed Volume III, with its index, in July, 1911. The second part of Volume IV was sent to the printer in June of the present year.

FORECASTS AND WARNINGS.

The work of forecasting daily weather and temperature changes, storms, cold and warm waves, and frosts—the primary duty of the Weather Bureau—received the careful attention of the corps of forecasters throughout the year. No important meteorological change occurred without notice having been given well in advance.

Storm warnings to Lake, seacoast, and West Indian stations, and frost warnings for the sugar, trucking tobacco, fruit, and cranberry regions, were issued whenever conditions justified. These warnings were successful. Particular attention was given to the hurricanes of September and October, 1910, and a number of testimonials commending the work of the bureau in connection therewith were received. The warnings of the approach of cold waves resulted in a saving of growing crops and prevented injury to many shipments of perishable goods and to farm stock. Daily forecasts of probable wind and weather conditions off the Atlantic coast, eastward to the Grand Banks, were issued for the guidance of transatlantic steamships.

HURRICANES OF THE YEAR.

WEST INDIAN HURRICANE OF SEPTEMBER, 1910.—This storm was first detected near San Juan, P. R., on September 6. It moved in a west-northwest direction, and by the morning of September 14 had reached the Texas coast near the mouth of the Rio Grande. Warnings were issued regularly until the storm disappeared. No loss of

life and no wrecks occurred, nor was much damage done, except on the north coast east of San Juan. The following editorial from the New Orleans Daily Picayune of September 15, 1910, has reference to this storm:

Notwithstanding the threatening weather which prevailed over southern Louisiana Tuesday, no damage was experienced, as the storm passed southward some distance out in the Gulf. However, sugar and rice planters were greatly alarmed. A severe wind storm at this season of the year would lodge the cane and would result in great injury to the rice crop, because few of the rice planters are prepared to flood their rice fields to such an extent as would prevent great damage from high winds. The excellent advices issued from day to day by the United States Weather Bureau in connection with this storm from the date of the inception has been in keeping with its past record. Tuesday morning, long before the storm was being felt at any coast station, shipping, commercial, and agricultural interests along the Gulf coast were advised that the storm was some distance out in the Gulf southeast of the Texas coast, and was moving in a northwesterly direction toward the mouth of the Rio Grande River. Yesterday morning the storm was moving inland, with its center near the mouth of the Rio Grande, and high winds and high tides had occurred along the Texas coast, as though conditions had been made to fit the Weather Bureau's warnings. The value of a service which can foretell where such storms will strike the coast, as was done in this case, can not be estimated.

WEST INDIAN HURRICANE OF OCTOBER, 1910.—Attempts made in former years to get reports by wireless from vessels plying in the Gulf of Mexico and the Caribbean Sea met with small success, owing to the small range of the transmitting vessels. This past year, however, a concerted effort was again made to secure these reports, this time with gratifying results. A number of valuable reports were received from vessels in the region of tropical storms, that from the United Fruit Co.'s steamship *Abangarez*, latitude 14° 20' N., and longitude 81° 51' W., received on the evening of October 12, being particularly helpful in locating the most notable hurricane of the season, which struck Key West, Fla., on the afternoon of the 17th. Although the pressure had been below normal for several days previously, this wireless report was the first definite information the Weather Bureau had of the severe storm in the Caribbean. In conjunction with the reports from the land stations, it enabled the forecaster to locate the center of the disturbance with a degree of accuracy which could not have been done through the use of observations made at land stations alone. By the morning of the 13th the hurricane center was about 200 miles south-southwest of Havana, Cuba, apparently moving northwestward. The storm passed to the westward of Havana on the afternoon of the 14th and over Key West on the afternoon of the 17th. It then moved in a northerly direction to southern Georgia, where it took a course more to the east, and passed off the Atlantic coast near Cape Hatteras on the 20th. During the progress of this storm timely advices regarding its location, intensity, and probable direction of movement were disseminated by every available means, including wireless, to interests liable to be affected by winds and tides. The following are among the testimonials received as to the value of the service rendered by the bureau in its advance notices of this storm.

From C. W. Jungen, manager of the Atlantic Steamship Lines of the Southern Pacific Co.:

I beg to express to you the appreciation of the management of this company for the valuable service rendered by the Weather Bureau during the tropical storm in the Gulf of Mexico and the Atlantic Ocean on or about the 13th to 19th instant, which overtook several of the company's ships in that vicinity. These bulletins were of great assistance to the masters of our ships in preserving the company's property and preventing the loss of life at sea.

From Senator Duncan U. Fletcher, of Florida:

Permit me to say that I have always appreciated the value of the Weather Bureau to the country, and the service rendered before and during the recent hurricane has further emphasized its indispensability to Florida. * * *

From J. R. Brown, president of the Florida East Coast Railway, to the official in charge of the local Weather Bureau office at Jacksonville, Fla.:

I am pleased to express our appreciation of the excellent service rendered by the Weather Bureau through your office during the past season, and the frequent advisory warnings sent down the line during the approach of the recent hurricane. The information thus furnished, I am advised, enabled us to get practically all our large fleet of floating equipment into hurricane harbors, thus making our loss in this respect comparatively light. We were also enabled to get our scattered forces of about 1,500 men into safe locations, so that there was no loss of life. By use of hurricane flags, rockets, and signal whistles we were enabled to warn the inhabitants of the keys, the fishing fleet in the locality of our work, as also two steamships anchored at Knights Key Harbor. Had we depended on the barometer we would not have been able to secure one-half of our floating plant before the storm was upon us.

From an editorial in the Tampa (Fla.) Morning News of October 20:

That there was no loss of life during the storm is largely due to the efficiency of the Weather Bureau in warning mariners.

From an editorial in the Vicksburg (Miss.) Herald of October 19:

There can be no question that a grave calamity has befallen Cuba and the Florida Peninsula as well. The one gratifying circumstance in it is the proof furnished of the infinite value of the Weather Bureau warnings, which gave ample time for all shipping to seek shelter in safe anchorage.

WEEKLY FORECASTS.

Forecasts of a general character for a week in advance, based on the atmospheric conditions exhibited by the daily chart of the Northern Hemisphere, have been issued on each Sunday throughout the year, except during the last two weeks of June, 1911, and special forecasts announcing important weather and temperature changes were made when occasion called for them. These forecasts have in the main proved reasonably successful, and the demand for them on the part of the press and others has steadily increased.

The weekly forecast issued on August 21, 1910, attracted special attention. In this forecast it was announced that a cool wave would pass over the country the latter part of the ensuing week. This cool wave gave the lowest temperatures of record for August in the Northern Rocky Mountain Region and the Plains States, and snow fell in Wyoming. It caused frosts in Idaho, Montana, Wyoming, Colorado, Nebraska, North Dakota, Minnesota, and Wisconsin, and light frosts at exposed places in New England and New York. The following favorable comments on the part of the press, subsequent to the issue of the forecast, indicate the widespread interest taken in its successful fulfillment:

Oklahoma (Okla.) Oklahoman:

The day was a great triumph for the weather man. The prophecy was on long time, as weather forecasts go. It was made last Sunday. It was accurate to the hour, and to distance, direction, and temperature: geographically correct—absolutely correct. The Sunday forecast said that the wave would start in the Northwestern States and sweep east across the country. For Oklahoma and vicinity Thursday was the day set for the cold spell, and the cold spell came. No one but the doubter was disappointed.

Louisville (Ky.) Courier-Journal:

The present remarkably cool weather for this season of the year was accurately forecast by the United States Weather Bureau one week in advance.

Springfield (Mo.) Republican:

The Weather Bureau at Washington predicted last Sunday that a cool wave would strike this vicinity about the middle of the week, didn't it? And it said that the cool wave would be preceded by very hot weather. * * * The long-distance forecasting department of the Washington Weather Bureau scored one of the biggest tallies in its history Thursday morning, when the cold wave came along.

Boston (Mass.) Transcript:

The official forecaster's reputation as a successful long-range forecaster is better than ever in this vicinity. His cool wave for the East, predicted a week ago, arrived last night on scheduled time, and the temperature consequently was "in the dumps" over night. There were no frosts, to be sure, but the drop in temperature was sufficient to justify the "cool wave" forecast.

Charlotte (N. C.) Observer.

The Observer on last Monday morning published a weather prediction issued from Washington, D. C., stating that chilly blasts would sweep across the country during the week. * * * This forecast was read by many, but most people straightway dismissed it from their minds. During the week, however, there followed such a remarkably accurate verification of the prediction made days before the cold started, that the public sat up and took notice. * * * It only affords another striking illustration of the remarkable progress being made in the development of the weather science, and shows also what an excellent and highly valuable service is being given by the Government in this department. * * * The wave advanced true to form and reached the Atlantic by Saturday morning. It pays to listen to the weather man.

INTERNATIONAL WEATHER CHART.

A chart of the Northern Hemisphere is prepared each morning in the forecast map room of the Weather Bureau at Washington, based on reports from a number of stations selected to show, in a general way, the fluctuations of barometric pressure in the great centers of action. The most northerly stations from which reports are received are Nome, Tanana, and Eagle, in Alaska, at about latitude 65° N., while the most southerly is Manila, in the Philippine Archipelago, at approximately latitude 14° N.

Somewhat meager data from five Alaskan stations give a fair indication of barometric changes in that region, but when it is considered that the forecasts for a week in advance are based chiefly on the Alaskan reports, it would appear that a greater number of stations, not so widely separated, should be available to give a more complete survey of the atmospheric changes taking place in that area. Action has been taken looking to the establishment in the near future of a station on the Aleutian Islands at Dutch Harbor. Reports from this station will give valuable information concerning storms that pass from the eastern coast of Asia northeastward and finally reach the United States. At present, storms of this type cross the Pacific Ocean south of latitude 58° N. and strike the North American Continent without warning or indication of their approach. With a station in operation at Dutch Harbor, few, if any, storms should reach the continent without their coming first being indicated by some of the Alaskan reports.

During the latter part of the past year reports were received regularly from Nemuro, Japan, and from Shanghai, China. These

reports have proved of much value in accounting for the development of disturbances in our Northwest.

Summarized in a general way, a study of the international weather map furnishes indications of weather conditions in the United States several days in advance, somewhat as follows:

(1) Barometer rising and above normal over the Asiatic high area; barometer falling and below normal in the Bering Sea low area, and rising over the Azores and falling over Iceland, indicates a period of mild weather over the northern and eastern districts of the United States.

(2) Barometer falling and below normal over Bering Sea, and falling over the Azores and rising over Iceland, indicates a period of cool weather generally east of the Rocky Mountains.

(3) When the great continental high-pressure area extends over west-central Europe and the British Isles it checks the movement of North Atlantic storms and finally affects the rate of progression of high and low pressure areas over the United States. The usual rate of progression of high and low pressure areas over the United States is resumed 5 or 6 days after a return to normal conditions has set in over west-central Europe.

(4) In its normal distribution atmospheric pressure is high over the eastern and relatively low over the northern and northwestern portions of Europe. Under these conditions the progression of storms over the United States is normal. When, however, this arrangement of pressure is reversed or disturbed, abnormal storm movements or features will be observed.

(5) At times when the air masses up over western Asia and continental Europe the advance of the Atlantic storms is checked, low pressure prevails for several days over the British Isles, high pressure builds up over the Atlantic Ocean, and the eastward progress of high and low pressure areas over the United States is retarded. This retardation of highs and lows over the United States is not interrupted until about 5 or 6 days after normal pressure conditions are resumed over western Europe.

(6) A slight shifting to the westward of the summer North Atlantic high-pressure area gives temperatures above the normal and generally dry weather over eastern portions of the United States. If the center of this high-pressure area shifts to the westward, south of its usual position as regards latitude, the heat is general from the Gulf of Mexico to Canada. If, however, the center occupies a more northerly latitude in its westward position, the heat area is confined to the more northerly districts of the United States, while the South Atlantic districts receive the benefits of the easterly winds from the ocean.

(7) When the Atlantic high-pressure area occupies a position east of its normal location over the Atlantic Ocean, or exhibits pressure below normal, cool weather for the season, or at least variable temperature, is experienced over the eastern portions of the United States.

(8) As a general proposition the North Atlantic high-pressure area controls to a great degree not only the summer weather of the greater part of the United States, but also the course and character of the West Indian hurricanes.

FROST PROTECTION WORK.

Special attention was given during the year to warnings for the benefit of shippers and growers of perishable products. Forecasts were sent out daily from a number of our larger stations, giving the probable temperatures likely to be encountered by perishable goods shipped in any direction.

Substations were established in the cranberry marshes of Massachusetts, in the citrus fruit districts of Florida, and in some of the orchard districts of Washington, Oregon, Idaho, Utah, Colorado, and California. During the frost season special reports are sent from these substations to the forecast center, where they are used in the preparation of a special forecast in the afternoon or early evening, supplementing the regular morning forecast. By this means the growers are enabled to take such precautionary measures as are available to protect their crops. In Washington, Oregon, Idaho, Utah, Florida, and California the fruit growers smudge and fire when necessary, while in the cranberry regions the cranberry growers flood their bogs to prevent injury. In this line of work it has been the policy to furnish the individual with information particularly applicable to his orchard, rather than to have him depend upon a general forecast that would apply to a large section, but could not accurately cover the section in detail. Effort has also been made to encourage the growers to organize and employ protective measures in saving their crops from frosts and freezes. Thus far the work has been successful beyond expectation. One example of the fruits of this work is instanced by a letter from Mr. Thomas F. Mahoney, secretary of the Chamber of Commerce of Grand Junction, which was published in the Denver News of May 18, 1911. In this letter it is claimed that the prompt action taken by the orchardists of Colorado's western slope on the receipt of the warnings of a severe freeze last spring resulted in the saving of \$2,500,000.

The following is from a letter written by the secretary of the Yakima Commercial Club, North Yakima, Wash., regarding the work of the past year in that section:

The timely warnings of danger given did much in the way of prevention of loss from frost, and it is the general belief that with better preparations on the part of the fruit growers another season, still greater benefits may be derived from the frost service of the bureau.

The president of the Provo Commercial Club, Provo, Utah, also testifies to the work of the bureau in that vicinity during the frost season of 1911, as follows:

Now that the frost period for this season is over and while the matter is still fresh in our minds, we wish to express to you our appreciation of your efforts in our behalf. There is no doubt but what your Weather Bureau has been of service to the fruit grower this season, and taken together with the keen personal interest you yourself have shown in the all-important question of "Saving the fruit," we are convinced that with the further aid of the Agricultural Department this question will be solved.

RIVER AND FLOOD DIVISION.

RIVER AND FLOOD SERVICE.

Two new river districts were created during the year, with headquarters at Indianapolis, Ind., and Iola, Kans., making a total of 56 river districts in operation at the end of the year. The new districts were established for the purpose of securing increased efficiency

of service, and are maintained with little increased cost of operation, as both previously formed portions of other districts. The Indianapolis district comprises the watershed of the Wabash River above the mouth of and including the White River, formerly a portion of the Cairo district. The Iola district comprises that portion of the watershed of the Neosho River from the headwaters to Neosho Rapids, Kans., formerly a portion of the Fort Smith district.

Nine new river stations were established during the year, and nine were discontinued, excluding those at Dayton, Ohio, and Fort Wayne, Ind., where regular Weather Bureau stations were opened with the river work as a portion of their duties. Four rainfall stations were also discontinued.

At the end of the year river observations taken at regular Weather Bureau, paid, and cooperative stations made a total of 601 stations from which reports are available for the benefit of those interested in the rivers of the country.

No automatic river gauges were installed during the year, but substantial inclined concrete gauges were installed at Portsmouth, Ohio, and Mount Vernon, Ind.

Owing to a large deficiency in the precipitation of the year over a considerable portion of the country, there was an absence of great floods, except in California, where, during February and March, heavy winter snows and rains combined to cause floods, with resultant damage estimated at \$1,750,000. In July and again in October the smaller tributaries of the Ohio River were in flood as a result of heavy local rains. The damage to crops and other interests amounted to about \$5,500,000.

By informal agreement with the Forest Service of the Department of Agriculture and the United States Reclamation Service of the Interior Department, the Weather Bureau was designated to ascertain and publish in the Monthly Weather Review the losses by floods in the United States. A summary of this character indicates that the losses during the year were about \$7,700,000, of which more than three-fourths fell upon the farmers. The value of property saved through the warnings of the Weather Bureau was estimated at \$1,047,000.

The warnings issued for the floods were of value. The great disproportion between the losses and the value of property saved is due to the fact that three-fourths of the former were on crops that warnings could not have saved.

From present indications the new work contemplated during the coming year will not be extensive. On July 1, 1911, river service will be extended over the Neuse River of North Carolina, and river stations opened at Neuse and Smithfield, N. C. The station at Edisto, S. C., will be reopened, and a new station established at a suitable location on the Combahee River for the benefit of the rice planters. A few additional stations will probably be needed along the lower Arkansas River and its larger tributaries. In the extreme West it is proposed to divide the district of California, establishing a new district for the San Joaquin River, with headquarters at Fresno, Cal. This river is now under the supervision of the local office at Sacramento, and the change will result in more prompt service in time of flood. It is also proposed to establish, if possible, a new district at Los Angeles, Cal., for the purpose of issuing flood warnings for the smaller streams of that section.

Steady progress has been made in the preparation of forecast schemes for the Ohio River and its larger tributaries. Schemes have been completed for the Cumberland and Tennessee Rivers, and one for the Wabash River is well under way. This will complete the scheme for the entire Ohio River watershed, except that portion of the main stream between Mount Vernon, Ind., and the mouth, which it is hoped also to finish within a few months. Considerable work has also been done on schemes for the Savannah and Santee River systems.

MOUNTAIN SNOWFALL WORK.

During the last two years the Weather Bureau has made systematic measurements of the amount of snowfall in the mountain regions of the West for the purpose of determining as accurately as possible the amount of water available for agricultural and commercial interests during the coming spring and summer seasons. It is hardly necessary to comment on the importance of this work, which thus far has been largely experimental on account of uncertainties as to the instrumental equipment required and the proper method of determining the water equivalent of the snowfall. The snow bins and snow platforms installed some time ago have not proved entirely satisfactory. Prof. Marvin, of the Instrument Division, has been engaged in the work of devising improvements, and it is hoped that the snowfall stations can be supplied with better apparatus within a year or two. In the meantime no new stations will be opened. During the year 61 stations were closed, experience having demonstrated that they were no longer of importance. At the end of the year there were 281 mountain snowfall stations in operation.

In connection with the study of snowfall and its consequent run-off, a systematic snow survey was begun in the watershed of Maple Creek, near Springville, Utah. While the work was of an experimental nature, it has an immediate effect on the owners of 227 tracts of land that are irrigated by the melted snow waters from the Maple Creek watershed, and it is expected that the experience obtained will be valuable in connection with the future study of the general problem. Thus far the comparatively small outlay in experimental work has been well expended. A report of the work carried on during the spring of 1911 was prepared by Messrs. A. H. Thiessen and J. C. Alter, of the local office of the Weather Bureau at Salt Lake City, Utah, and published in the Monthly Weather Review for April, 1911. About 2,000 soundings and 277 measurements of the depth and density of the snow were made with the density apparatus devised by Prof. Marvin. The final results showed an average snow depth of 36 inches, with an average water equivalent of 11.5 inches, or 32 per cent, making 3,833 acre-feet of water, or enough to spread a layer of water 14 inches in depth over all the land irrigated by the stream. This is the first attempt at a definite measure of the water equivalent of accumulated snowfall, the great value of which to irrigation farmers and those interested in water power is apparent. It is thought that with two years' more work in the Maple Creek watershed sufficient observations will have been obtained to permit of accurate forecasts of water supply from the winter snowfall. The system can also be extended to other and larger projects, and the work will be limited only by the amount of funds available for the purpose. The

report on the preliminary campaign in the Maple Creek watershed has brought many expressions of commendation from farmers and hydraulic engineers.

EFFECTS OF FORESTS ON CLIMATE AND STREAM FLOW.

As stated in my last report, the Weather Bureau and the Forest Service, with the permission of the Secretary of Agriculture, are cooperating in an exhaustive study of the entire question of forest effects upon climate and stream flow. It is believed that the data to be secured will be of such a character as to shed valuable light upon the subject. The experiment station at Wagon Wheel Gap, Colo., established for the purpose of this investigation, is now on a firm basis, and a complete series of observations has been made during the last eight months. Cooperative meteorological stations are also maintained in the Coconino National Forest in Arizona, and in the Fremont National Forest in Colorado, data from which will be available for study and comparison in connection with the records at Wagon Wheel Gap.

However, it should be well understood that no results obtained in this semiarid region would be of any value as a criterion for determining problems in connection with run-off that obtain in the humid regions of the East. It is hoped that in course of time an experimental area may be secured and the necessary plant installed in both the Allegheny and White Mountain regions.

DIVISION OF OBSERVATIONS AND REPORTS.

The new "Division of Observations and Reports," formed during the year, has supervision of the collection and distribution of telegraphic meteorological reports, the distribution of forecasts and warnings, the issue of station maps and bulletins, and the marine work of the bureau.

At the close of the year there were in operation 197 regular observing stations. The station at Jupiter, Fla., was discontinued during the year and one established at Miami, Fla., in its place. New stations were also established at Fort Wayne, Ind., and Dayton, Ohio. Of these regular stations 164 take two observations daily, at 8 a. m. and 8 p. m.; 25 take one observation daily at 8 a. m., and 8 take one observation daily at 8 p. m., seventy-fifth meridian time. These observations are telegraphed to Washington and over circuits to other stations for use in making the daily maps for forecast purposes and the daily weather maps and commercial maps for issue to the public.

The United States is divided into six forecast districts, with centers at Washington, D. C.; Chicago; Denver; Portland, Oreg.; San Francisco; and New Orleans, at which places the forecasts are made and telegraphed to distributing centers. From these points they are furnished to the public by telegraph, telephone, and postal card.

SPECIAL METEOROLOGICAL STATIONS.

There are 50 special meteorological stations in operation. Of these, 19 are for use in the general forecast work of the service and in making special frost predictions for the orchards of Oregon, Washington, Utah, Idaho, and Colorado; 8 for use in frost predictions for

the cranberry interests of Massachusetts, Wisconsin, and New Jersey; 9 for use in the special predictions for the vineyard and citrus-fruit interests of California and Florida; 8 in the West Indies, rendering reports from July 1 to November 15 for use in the special hurricane forecasts, and 6 in Alaska for use in the general forecast work of the service.

Under the Portland, Oreg., center, four important fruit districts have been grouped — at Lewiston, Idaho, Boise, Idaho, North Yakima, Wash., and in the Rogue River Valley of Oregon. In the Lewiston district the observing stations are located in the Lewiston orchard district and across the Snake River at Clarkston, Wash., each station being the center of its respective district of orchard bench land. The Boise district has an observer at Meridian who cooperates with the Boise station. In addition to the special observer at North Yakima a regular trained observer was put in charge for the fruit season, and arrangements were made to receive reports from cooperating stations at Wapato, Zillah, Sunnyside, Moxee, and Natchez. In the Rogue River Valley a special station was established at Medford under the charge of a trained fruit and orchard superintendent; and in addition to the old observing stations at Siskiyou and Marshfield, cooperating stations were located at Grants Pass, Ashland, and Jacksonville.

The Salt Lake City office is in charge of the frost-warning service around Provo, Utah, while the fruit region of the Grand River Valley of Colorado receives warnings from Grand Junction. In the citrus-fruit region around Los Angeles the observer at that station is in charge of the frost warnings, with special observers at Pasadena, Redlands, Riverside, San Bernardino, and Santa Barbara. San Francisco sends warnings to the fruit interests of Northern California, with an observer reporting from Paso Robles.

In Florida, Jacksonville issues warnings for the fruit and vegetable industries, with special observers stationed at Bartow, Eustis, Titusville, and Gainesville. Arrangements are being made to investigate the fruit conditions of North Carolina.

Frost warnings are issued for the cranberry districts of Massachusetts, New Jersey, and Wisconsin, the most important cranberry-producing section being around Cape Cod, Mass. Arrangements were made during the season for more complete reports in that section by changing the station at New Wareham to the State bog at East Wareham, making the latter place the observation center. The instruments at South Carver were moved to a better location, and new stations were established at Halifax and Marstons Mills. Observations have been continued with good results in New Jersey. In Wisconsin the old station at Berlin was reestablished and conditions improved for observation.

FORECAST DISTRIBUTION.

The appropriation for this branch of the service was inadequate to meet the many demands for daily forecasts and special warnings during the past year. While the decrease in the number of places receiving the warnings at Government expense was 60, there was an increase of more than 500,000 in the number of telephone subscribers to whom the forecast was delivered by free telephone distribution; owing to the very favorable arrangements entered into between the

bureau and the various telephone and telegraph companies. By an arrangement between the Southern Bell Telephone & Telegraph Co. and the Weather Bureau, which goes into effect on July 1, 1911, this distribution by free telephone will be materially increased during the next fiscal year.

At the close of the year the number of places receiving forecasts at Government expense was 2,120, while by free telephone distribution the forecasts were available to 4,251,347 addresses.

The following table shows in detail the distribution of daily forecasts and special warnings in the several States by the various means employed:

Distribution of daily forecasts and special warnings.

State.	At Government expense.			Without expense to Government by—				
	Forecasts and special warnings.	Special warnings only.	Emergency warnings.	Mail.	Rural delivery.	Telephone.	Railroad train.	Railroad telegraph.
Alabama.....	30	2	136	1,496	690	13,961	0	66
Arizona.....	5	2	0	191	0	7,399	0	0
Arkansas.....	21	10	102	932	979	25,238	0	14
California.....	99	47	0	1,037	2,680	98,212	0	0
Colorado.....	8	62	38	1,044	718	45,713	0	0
Connecticut.....	10	0	48	2,333	50	88,626	138	5
Delaware.....	8	1	16	152	296	4,865	0	27
District of Columbia.....	0	0	0	843	0	20,000	0	1
Florida.....	35	114	52	1,392	230	8,198	0	58
Georgia.....	33	32	233	1,839	1,002	34,318	0	149
Idaho.....	15	1	0	871	200	13,975	0	0
Illinois.....	114	6	408	3,547	2,498	372,779	0	17
Indiana.....	110	1	201	2,808	1,454	188,315	0	71
Iowa.....	144	7	335	2,727	4,472	121,770	25	0
Kansas.....	88	2	175	727	2,080	239,392	0	51
Kentucky.....	45	31	96	2,528	788	54,516	0	1
Louisiana.....	79	20	49	940	30	18,226	0	18
Maine.....	14	1	40	1,074	951	44,140	0	0
Maryland.....	18	4	46	1,984	571	28,950	0	76
Massachusetts.....	16	10	58	3,270	170	204,047	77	258
Michigan.....	68	4	316	5,419	600	225,433	206	387
Minnesota.....	74	3	171	1,944	3,885	159,599	0	13
Mississippi.....	47	10	59	1,352	1,041	26,166	0	6
Missouri.....	32	3	236	4,686	2,025	211,985	0	52
Montana.....	13	20	13	425	0	14,441	0	0
Nebraska.....	72	4	205	1,999	408	175,262	0	0
Nevada.....	6	0	0	84	0	646	0	0
New Hampshire.....	15	1	32	922	1,446	29,622	15	14
New Jersey.....	24	16	109	1,308	100	27,695	0	176
New Mexico.....	11	1	0	78	0	4,925	0	8
New York.....	118	49	346	7,491	1,794	258,826	197	176
North Carolina.....	74	15	163	1,624	2,096	27,819	0	0
North Dakota.....	24	0	93	292	1,659	20,919	0	0
Ohio.....	82	172	237	7,227	321	469,682	24	34
Oklahoma.....	32	2	16	637	591	6,624	0	130
Oregon.....	10	5	0	508	175	16,178	0	0
Pennsylvania.....	83	10	315	5,312	1,718	482,584	1	452
Rhode Island.....	2	0	11	759	0	1,400	13	18
South Carolina.....	29	9	105	1,040	576	10,679	0	38
South Dakota.....	56	9	70	840	115	52,235	0	0
Tennessee.....	48	5	284	1,850	1,055	37,909	0	3
Texas.....	78	54	227	1,663	1,188	168,406	0	63
Utah.....	6	24	0	324	661	12,025	0	0
Vermont.....	12	1	45	821	467	27,720	12	5
Virginia.....	53	8	84	1,578	1,393	39,314	101	72
Washington.....	20	3	0	1,072	1,091	3,560	0	0
West Virginia.....	26	8	53	968	0	38,320	0	17
Wisconsin.....	106	7	281	2,685	2,072	61,818	0	0
Wyoming.....	7	1	8	105	0	6,930	0	0
Total.....	2,120	797	5,512	86,948	46,336	4,251,347	809	2,376

STORM-WARNING DISPLAY STATIONS.

Fifteen storm-warning display stations were established at points on the sea and lake coasts during the year, and six were discontinued. Arrangements have been made to begin the display of storm warnings at Seddon Island—Tampa (Fla.) section—as soon as a tower can be erected. As is usual, the display of warnings on the lakes was discontinued for the winter on December 6 and resumed April 10. Inspection trips were made to 124 storm-warning stations.

The following statement gives the number of stations, arranged under district centers, receiving storm warnings:

District centers.	Paid stations.	Cooperative stations.	Weather Bureau stations.	Naval wireless stations.
Alpena, Mich.....	6	0	1	0
Atlantic City, N. J.....	0	4	1	0
Baltimore, Md.....	3	1	0	0
Block Island, R. I.....	1	0	1	0
Boston, Mass.....	24	7	2	4
Buffalo, N. Y.....	12	1	1	0
Cape May, N. J.....	1	0	0	0
Charleston, S. C.....	5	1	1	0
Chicago, Ill.....	25	2	1	1
Cleveland, Ohio.....	10	0	1	0
Corpus Christi, Tex.....	2	0	1	0
Detroit, Mich.....	0	1	1	0
Duluth, Minn.....	7	0	1	0
Eastport, Me.....	0	1	1	0
Erie, Pa.....	1	0	1	0
Escanaba, Mich.....	2	0	1	0
Eureka, Cal.....	0	1	1	1
Galveston, Tex.....	4	4	1	0
Grand Haven, Mich. ¹	0	0	1	0
Grand Rapids, Mich. ¹	0	0	1	0
Green Bay, Wis. ¹	0	0	1	0
Houghton, Mich.....	2	2	1	0
Jacksonville, Fla.....	8	12	1	0
Key West, Fla.....	0	2	2	1
Los Angeles, Cal.....	1	3	0	0
Marquette, Mich.....	1	0	1	0
Milwaukee, Wis.....	9	0	1	0
Mobile, Ala.....	4	4	1	0
Nantucket, Mass. ¹	0	0	1	0
New Haven, Conn.....	2	0	1	0
New Orleans, La.....	2	1	2	0
New York, N. Y.....	5	4	1	2
Norfolk, Va.....	6	4	4	1
Oswego, N. Y. ¹	0	0	1	0
Pensacola, Fla.....	3	0	1	0
Philadelphia, Pa.....	3	0	1	0
Port Huron, Mich.....	3	1	1	0
Portland, Me.....	3	2	1	0
Portland, Oreg.....	9	3	7	0
Providence, R. I.....	1	0	1	0
Rochester, N. Y. ¹	0	0	1	0
San Diego, Cal.....	0	2	1	1
Sandusky, Ohio ¹	0	0	1	0
San Francisco, Cal.....	2	6	4	3
San Juan, P. R.....	0	0	0	2
Sault Ste. Marie, Mich.....	5	0	1	0
Savannah, Ga.....	4	1	1	0
Tampa, Fla.....	3	8	1	0
Toledo, Ohio ¹	0	0	1	0
Wilmington, N. C.....	3	2	1	0
Total.....	182	80	61	16

¹ Not centers.

STATION MAPS AND BULLETINS.

The policy of discontinuing the station weather maps wherever the newspapers would publish the commercial maps, adopted in 1910, was continued during the past year, and has resulted in the maps being published at 74 places in 132 newspapers having a total daily circulation of 2,898,000. At first there was some opposition to the commercial map, but this gradually subsided as the vast enlargement of the service thus rendered through the newspapers came to be recognized. A few comparisons of the distribution obtained through the press with that possible through the maps issued at the stations are sufficiently convincing on this point. New York issues daily 1,013 weather maps as compared to 191,000 commercial maps; Chicago, daily weather maps 1,171, commercial maps 507,449; Philadelphia, daily weather maps 375, commercial maps 140,000. While the publication of the commercial maps has been substituted at 54 stations, the daily weather maps are still printed at 58 stations, the total daily issue being 15,000.

Daily weather bulletins (Form No. 1038) were published at 9 stations, the daily issue being 467.

Glass weather maps are changed daily at 42 stations, having a total number of 53 maps. These maps are displayed at boards of trade, cotton exchanges, maritime exchanges, at the stations proper, in the Washington Terminal Railroad Station, and in the Senate and the House of Representatives, in Washington, D. C.

MARINE WORK.

The field covered by this section of the bureau's activities includes the meteorological work of the principal oceans of the world and of the Great Lakes of the United States, the supervision of the wireless telegraph weather service, and the work of the vessel-reporting service.

METEOROLOGICAL CHARTS.

The meteorological work consists in the collection, compilation, and study of ocean and lake meteorological data, and the publication and distribution of the data thus obtained, by means of the marine meteorological charts of the Weather Bureau, which are distributed to mariners, maritime exchanges, and meteorological institutions throughout the world. The meteorological information collected in this manner is also furnished to the Hydrographic Office of the Navy Department, and forms the essential features of the Pilot Charts published and distributed by that office.

The publication of a series of monthly charts for the Indian Ocean and the Great Lakes will be completed with the issue for December, 1911, and with the others will constitute the first complete set of meteorological charts covering the principal oceans of the world and the Great Lakes of the United States.

The charts for the North Atlantic, North Pacific, and Indian Oceans and for the Great Lakes are published monthly, and those for the South Atlantic and South Pacific Oceans quarterly. They are mailed 40 days in advance of the month or quarter for which the chart is an issue.

The North Atlantic charts contain on their face the normals of pressure and temperature; tables for reducing barometer observations for comparison with data on the charts; wind roses, with percentages of gales and calms for each 5-degree square of latitude and longitude; storm tracks of recent years; fog areas and percentages of days with fog; trade-wind limits; sailing routes; magnetic-variation lines; location of wireless-telegraph stations; tables of equator crossings; a statement of the average conditions of wind and weather; storm-warning signals of the United States, Canada, Mexico, Great Britain, Ireland, Germany, Holland, France, and Portugal; and the United States submarine distinguishing and warning flags. On the reverse side appear as regular features articles on the temperatures of the air and the water surface, and charts of the currents of the North Atlantic and North Pacific Oceans. Special articles have been printed on West Indian Hurricanes, Waterspouts, Cyclones and Anticyclones, Weather Lore of the Sea, Fog and Fog Signals, and Ocean Currents.

The South Atlantic charts contain much the same general information as that appearing on the charts for the North Atlantic Ocean, slight modifications, such as the omission of fog areas and the addition of storm-warning signals for ports on the Indian coast, being the chief differing features. The same general similarity and minor differences are found in the charts for the North Pacific, South Pacific, and Indian Oceans.

The fog areas and the percentage of days with fog, as now shown on the charts for the North Pacific and Indian Oceans and the Great Lakes, have been pronounced particularly valuable features by those using the charts. Mr. H. C. Thomson, engineer in charge of the survey for a short-line railway and steamship route to Europe, states that the fog data for the North Atlantic chart as revised by the bureau have been an invaluable aid to his project. He has interested himself in an endeavor to secure fog data from Canadian lighthouses for incorporation in an article to be published on fog of the North Atlantic Ocean. The English Meteorological Office, on its chart of the North Atlantic, continues to make use of the fog data and shading published by the Weather Bureau.

A chart has been prepared, and will be published at an early date, showing the average direction and rate of movement of storm centers in each $2\frac{1}{2}$ -degree square of latitude and longitude in West Indian and Gulf waters.

The charts for the Great Lakes were begun with the January number of this year. They contain on their face normals of pressure and temperature; barometer reduction tables; wind roses; storm tracks; fog areas and percentages of days with fog; arrows showing direction of lake currents; magnetic variation lines; location of wireless-telegraph stations; a statement of the average conditions of wind and weather; percentages of days with rain, snow, fog, gales, and calms at lake stations; dates of opening and closing of ports on account of ice; wind-barometer indications for the Great Lakes; storm-warning signals of the United States, Great Britain, Ireland, and Canada; a table of verifying wind velocities at Weather Bureau stations; and the United States submarine distinguishing and warning flags. The reverse side presents monthly tables of wind velocities; seasonal tables of snow and ice; lists of lake wireless-telegraph stations, with

call letters for each; and lists of submarine signal-bell stations, with code.

As evidence of the general appreciation in which the charts are held, the following are quoted from letters received during the year:

From the American consul at Dundee, Scotland:

I take this opportunity to say that recently the captain of one of the Clan liners, then in this port, called at this office on receiving a letter sending him a supply of these weather-report forms and ocean charts, when he expressed his thanks to the American Government for the courtesy in supplying these charts, and desired to say how much they were appreciated by British shipmasters, at the same time speaking in terms of the highest commendation of the system adopted for collecting materials for keeping the charts fully up to date, to which he would give his cordial cooperation.

From Capt. T. W. Pickard, of the British S. S. *Ningpo*:

I am of the opinion that your publications are of extreme value to seafarers generally, and I think that we should all cooperate with you in the good work.

MISCELLANEOUS PUBLICATIONS.

Additions have been made to the useful information contained in the calendars for the Atlantic and Pacific Oceans, and these have been distributed to all cooperating officials. The large chart, formerly issued, showing the classification of clouds, has been put in book form, making it more convenient for use and increasing its durability. It contains full descriptive matter and illustrative plates, with a view to aiding observers in the identification of the several cloud forms according to the International System of Classification. A new and enlarged edition of the Instructions to Marine Meteorological Observers, with a complete index, was issued during the year. The form used in reporting observations has been remodeled into a more light, compact, and convenient form. Its reduction in bulk will also effect a saving in postage.

COLLECTION OF METEOROLOGICAL DATA.

The weather reports from vessels are mailed to the Washington office by the observers or are forwarded through the local offices of the Weather Bureau. In foreign ports they are usually forwarded through the American consular offices. The American consuls at 154 of the principal foreign ports have assisted the bureau in the collection of marine meteorological data from vessels and in the distribution of meteorological forms, charts, and pamphlets. During the year, 2,416 cooperating observers forwarded 10,669 books of weather reports.

The Weather Bureau maintains marine centers at its principal seacoast and lake stations, and an official at the center visits vessels in the harbor for the purpose of comparing barometers, securing observers, and collecting marine meteorological observations. Officers and observers of cooperating vessels visit the offices of marine centers for information, comparison of instruments, and supplies of meteorological charts and forms. These offices are equipped with standard instruments, marine instrument shelters, textbooks, and other accessories to this work. Assistants are assigned to special duty at New York, Boston, Philadelphia, and Seattle in connection with this work. The official at Seattle has supervision of the meteorological work of all vessels entering Puget Sound.

The bureau is indebted to the Weather Bureau of the Philippine Islands and to the Hongkong Observatory for storm tracks of the western portion of the North Pacific Ocean; and to Prof. Froc, of the Zi-ka-wei Observatory (Père H. Gauthier, compiler), for approximate tracks of storms of the middle and high latitudes of that ocean. Other valuable data have been contributed by the Indian Meteorological Department; the Australian Meteorological Service; the Meteorological Office, London, England; the Meteorological Service of Canada; and the Deutsche Seewarte, Germany.

WIRELESS TELEGRAPH SERVICE.

San Francisco received 206 and Portland, Oreg., 244 wireless reports of observations during the year. These messages are sent and received without expense to the bureau through the courtesy of the vessel captains, the United Wireless Telegraph Co., and the naval wireless stations. Many of these reports are received at Katalla or Cordova, Alaska, and forwarded by the Signal Corps cable free of cost.

It is expected that the number of observations reported by wireless telegraph will be increased during the coming year as a result of the regulations, effective July 1, 1911, requiring all vessels of a certain class to be equipped with sufficient apparatus for radio-communication.

VESSEL-REPORTING STATIONS.

The Weather Bureau stations at Block Island, Cape Henry, Sand Key, Southeast Farallon Island, Point Reyes Light, North Head, Port Crescent, and Tatoosh Island, in addition to their meteorological work, are required to report all passing vessels, wrecks, marine disasters, and casualties, and to transmit communications between masters, owners, underwriters, and others interested. A total of 28,098 vessels were reported and notice of 47 casualties was given during the year.

The stations at Cape Henry, Sand Key, Southeast Farallon Island, Point Reyes Light, North Head, and Tatoosh Island are equipped for day signaling by international code, and are prepared to transmit messages by telegraph. Cape Henry and Sand Key are also equipped for night communications by flashlight (Morse code). An acetylene plant for this purpose was installed at Cape Henry during the year.

The station at Jupiter was closed as a vessel-reporting station on April 20, 1911.

Cape Henry uses the telephone and telegraph in reporting to Norfolk and Newport News. A list of vessels passing that station is sent daily to the Norfolk press and the New York Maritime Exchange. All naval vessels are reported to Norfolk and in some cases to the Navy Department at Washington. The Maryland and Virginia pilot associations cooperate with this station, and such vessels as do not burn night signals or can not be seen on account of fog are reported each morning by the pilot boats. A time flag is dropped daily at noon for the benefit of the pilot boats and other vessels in the offing.

When the wireless telegraph regulations become effective, an effort will be made to have the captains and operators on all approach-

ing steamers report the fact by wireless telegraph to the Navy wireless station at Tatoosh Island, and, in case of fog, to use this means to report their passage to and from the strait.

The service rendered by the seacoast telegraph and vessel-reporting stations of the bureau has been of great benefit to shipping in times of disaster during the last year. At about 11 p. m., September 1, 1910, the steamer *Watson*, bound from Puget Sound to San Francisco, with passengers and general cargo, ran ashore at Waddah Island, Wash. It was floated at 1 a. m., September 3, by the aid of the life-saving tug *Snohomish*, which was wired for at Port Angeles by our observer at Port Crescent immediately after the wreck. On December 10, 1910, following the wreck of the schooner *William H. Davidson*, our repairman at Manteo, N. C., established a temporary telegraph station on the coast about 30 miles north of Manteo, at the scene of the disaster, and rendered great assistance to the master and crew. Twelve wrecks occurred between Cape Henry and Hatteras during the year, all of which were reported by the life-saving stations to the officials at the Weather Bureau telegraph offices at Cape Henry, Hatteras, and Manteo, who in turn promptly telegraphed the information to the various agents, owners, revenue cutters, wrecking companies, and maritime exchanges. It is estimated that fully \$328,250 was saved through the assistance rendered the vessels in distress as a result of these timely reports. Reports of 18 casualties on Lake Huron, in which property valued at \$350,000 was endangered, were also given out from the Alpena, Mich., station, as a result of information received by our observer at that point over the Weather Bureau land and cable lines running between the mainland and Middle Island and Thunder Bay Island.

CLIMATOLOGICAL DIVISION.

The Annual Report of the Chief of the Weather Bureau, 1909-10, was printed and ready for distribution early in the present calendar year. The transfer of the composition and printing of the Monthly Weather Review from the central office of the Weather Bureau to the Government Printing Office has occasioned some delay in the issue of that publication, but it is probable that arrangements can be made whereby its issue at a slightly earlier date may be possible.

The issue of the National Weather Bulletin, weekly during the crop-growing season and monthly thereafter, continued as in the past. Its increased circulation as a result of numerous requests indicate that its value is rapidly becoming more widely known and appreciated.

The weekly and monthly summaries of the weather conditions in Porto Rico and Hawaii were issued as in the past, as well as those for Iowa, in cooperation with the weather service of that State.

Weekly summaries of the snow and ice conditions, with special reference to the districts east of the Rocky Mountains, were issued as usual during the winter, as well as the monthly summaries of snowfall conditions, for the benefit of irrigation and other interests in the mountain portions of the West. The latter contain more data than formerly, and the information they present as to the amount and distribution of the snow in the mountains, and its condition as regards prospects for early or late melting, has proved of much value

to engineers and those dealing with the storage of water for power purposes and its distribution for irrigation.

The daily bulletins of weather conditions over the great corn, wheat, cotton, sugar, and rice growing States have been issued regularly from about 40 selected points in those districts, the total issue amounting to more than 2,000 copies daily. The demands for the extension of these services have been numerous and persistent, especially for the establishment of additional telegraphic reporting stations in the cotton-growing sections of Texas and Oklahoma and the wheat-growing districts of Montana and the Dakotas. These demands have been partially met by the establishment of about 20 additional telegraphic reporting stations, mostly in the western portion of Texas and in the Dakotas. The necessity of more stations of this character is still being urged by the many beneficiaries of these services.

The published annual summaries of climatological data for 1910, for the several States, have served as valuable additions to the series, which has been continued since 1896.

The preparation and printing of the 106 Summaries of Climatological Data, covering the entire United States, have been completed. These summaries have proved almost invaluable in answering the thousands of requests for information regarding the climatic features of the different portions of the country, and the public demand has been so great that reprints of several of the earlier issues have already become necessary.

During the year there was prepared and issued as "Bulletin V, Frost Data of the United States," a set of charts showing the average dates of first killing frost in autumn, average dates of last killing frost in spring, earliest dates of killing frost in autumn, latest dates of killing frost in spring, and the length, in days, of the crop-growing season for all portions of the United States. These charts were prepared from the records of about 1,000 cooperative observing stations having the greatest length of record. As the observations selected were made largely in the open country and therefore removed from the artificial conditions that prevail in the cities, where most of our regular stations are located, they show the conditions that are liable to prevail in the fields, orchards, and gardens more accurately than ever before attempted.

The Weather Bureau derives much of its important climatological data from the records of its cooperative observers, of whom there are at present about 4,000, reporting from points well distributed throughout the entire United States, including Alaska, Porto Rico, and the Hawaiian Islands. Changes in this feature of the work included the opening of 258 new cooperative stations, and the discontinuance of 150 formerly in operation.

The great extension of the agricultural interests, especially those of trucking and fruit raising, necessitates more exact knowledge regarding the details of the climate of the country as an aid in determining the crops and fruits best suited to the various portions. At the present time this need can only be met by the data furnished by the cooperative observers of the bureau.

The demands for the extension of these reporting stations have been much greater than it was possible to meet. As a rule, new stations have been established only in the more recently settled dis-

tricts of the western portion of the country, where the necessity for reliable climatological data is most urgent.

The routine work of the division, comprising the furnishing of climatic data to several thousand applicants, the preparation of certified data showing weather conditions for use in courts, and the tabulation of data into the permanent record books, has been carried forward as usual.

During the year a large number of the original records, including all the river reports, and the summaries of climatological data from 1906 to 1910, inclusive, have been collected, arranged, and properly bound. In September, 1910, the work of examining the original meteorological records from stations was transferred to this division, due to the discontinuance of the distributing division.

The large accumulation of original records is rapidly exhausting the available storage room in the vault, which will soon have to be enlarged if these valuable records are to be kept free from danger of destruction by fire.

INSTRUMENT DIVISION.

The work and duties of the Instrument Division have remained essentially the same during the past year as heretofore. The equipment of instruments at about 200 telegraphic stations and about 4,000 cooperative stations has been maintained in the best condition possible.

Improvements have been made in the equipment of the storm-warning display stations at Delaware Breakwater, Del., Cape Henry, Va., and Sand Key, Fla., through the substitution of acetylene gas for oil in the lanterns, and more particularly through the introduction of separate lanterns, operated by a special signaling key for use in flashing messages from the stations to passing vessels. Credit is due to Mr. J. F. Newsom, in charge of the station at Cape Henry, for the development of this and other useful apparatus for signaling passing vessels.

Kiosks were installed during the year at Indianapolis, Ind., Salt Lake City, Utah, and Memphis, Tenn. These structures, which are now to be found at 29 stations, have met with universal commendations from commercial bodies and the general public, and requests for others are on file, awaiting consideration at such time as funds may become available for their erection. The kiosk has proved of special value in placing meteorological and climatological data of general interest before the public, as well as in affording a display of the instruments used for indicating and recording temperature, humidity, rainfall, and atmospheric pressure. During the year an improved arrangement of counters was devised by Mr. Maring, of the Instrument Division, for showing the accumulated rainfall since January 1, side by side with the normal fall for the same period, so that the data could be compared at a glance and the excess or deficiency for the current year noted.

Special forms of apparatus promising to give satisfactory results in the accurate measurement of snowfall in the mountain regions are described and illustrated in an Instrument Division circular issued during the year under the title "Measurement of Precipitation." A limited number of sample gauges were installed late in the season at a

few selected stations, but the records obtained are not as yet sufficiently numerous to bring out any definite results.

Work upon the apparatus for the absolute measurement of solar radiation has been carried forward, and a number of comparisons have been made with different types of receivers, bridges, etc. Orders were placed in the latter part of the year for an improved form of recording Wheatstone's bridge for the continuous registration of sunshine.

The seismographs at Washington have been maintained in operation throughout the year, but no work of a seismological character has been done at any of the other stations, notwithstanding the general call from a number of sources that the Weather Bureau engage in this important work. It is hoped ample means and authority will be granted the Weather Bureau to add seismological work to its present duties.

LIBRARY.

During the year just ended, 1,064 books and separate pamphlets were added to the library, which now numbers approximately 31,000 volumes. All additions were fully catalogued under author and subject.

As heretofore, all the scientific periodicals received in the library, including annuals, were regularly searched for articles of meteorological interest. These periodicals include all the important journals of general science, and most journals devoted to physics, geophysics, geography, and other subjects germane to meteorology, in many languages. The proceedings and transactions of learned societies are well represented. All articles of permanent meteorological interest were catalogued under author and subject; and in many cases brief notes were added on the catalogue cards to amplify the information conveyed by the titles.

The periodical literature is, as a rule, more highly specialized than that published in book form, and is therefore indispensable to the special student. The work of cataloguing such literature under appropriate topical headings, about a thousand of which are now used in the library, requires on the part of the cataloguers a wide knowledge of meteorology and of the principal foreign languages, besides familiarity with library science in general. Hence the Weather Bureau needs to maintain a strong library staff, specially trained in handling the cosmopolitan literature of meteorology, and in sympathetic relations with the scientific staff of the bureau, to whom it is essential that this literature shall be made readily accessible.

Only by virtue of its direct exchange relations with scientific institutions throughout the world is the bureau able to secure promptly all the current publications on meteorology. Much of this literature, especially that of an official character, could not be obtained by purchase, even if the funds were available. The periodical publications of the bureau, especially the *Monthly Weather Review* and the *Bulletin of the Mount Weather Observatory*, are an indispensable means of securing valuable literature through exchange.

Select lists of new meteorological publications have been published regularly in the *Monthly Weather Review*, as in former years. A revised edition of the librarian's "Brief List of Meteorological Text-books and Reference Books" was issued during the year.

The library continues to make all translations from foreign languages required in the bureau; to supervise the small libraries maintained at about 200 stations; and to perform the work at the central office in connection with promotion examinations. All these classes of work have grown steadily during the past year.

Several station libraries have been strengthened by the addition of important works in German and French, dealing with branches of meteorology that are not adequately treated in English. This applies especially to the literature of atmospheric electricity, atmospheric optics, and climatography.

In recording the growth of the library it appears proper to mention specifically a few of the more important meteorological works published in the course of the year, copies of which have been received.

Doubtless the greatest interest in this connection attaches to the completion of J. Hann's *Handbuch der Klimatologie*, third edition, of which the third and final volume has recently appeared. This work, in its successive editions, is the only extensive treatise on the climates of the world published during the past 20 years.

W. Trabert's *Lehrbuch der Kosmischen Physik* (Leipzig, 1911) is the most noteworthy recent publication belonging to the class of general textbooks of meteorology. A long-awaited new edition of the *International Cloud Atlas* has appeared. It introduces few changes in the existing classification of clouds, officially adopted in all countries.

Aerology and aeronautical meteorology engage the attention of a rapidly increasing number of writers. Dr. Franz Linke's *Aeronautische Meteorologie*, the first volume of which was recently published, is the prototype of a class of books likely to become common. It is a practical handbook dealing with the branches of meteorology of special interest to aeronauts. A third edition of Moedebeck's *Taschenbuch für Flugtechniker und Luftschiffer* is, like the earlier editions, strong in the meteorological branches of the subject. Messrs. A. L. Rotch and A. H. Palmer have issued a novel series of *Charts of the Atmosphere for Aeronauts and Aviators*. The British Government has published a noteworthy Report of the Advisory Committee for Aeronautics, 1909-1910, containing several papers by the director of the meteorological office.

The Carnegie Institution has published the first volume of a work on *Dynamic Meteorology and Hydrography*, by Prof. V. Bjerknes and others. Its object is to present the fundamental facts and principles of the subject in a form suitable for treatment by the mathematical physicist, in part according to methods not heretofore applied.

Dr. B. Walter has described an ingenious method of photographing lightning flashes with two cameras, one moving and the other stationary. (*Über Doppelaufnahmen von Blitzen*, Hamburg, 1910.) Dr. Süring has contributed an important treatise on meteorological photography to K. W. Wolf-Czapek's *Angewandte Photographie in Wissenschaft und Technik*, volume 1 (Berlin, 1911).

Important works on the circulation of the atmosphere included *The Trade Winds of the Atlantic Ocean*, published by the British Meteorological Office; W. J. S. Lockyer's *Southern Hemisphere Surface-air Circulation*, published by the British Solar Physics Committee; and a fourth installment of H. H. Hildebrandsson's *Quelques*

Recherches sur les Centres d'Action de l'Atmosphère (Upsala, etc., 1910).

The Bureau of Soils of this department published a bulletin by E. E. Free, The Movement of Soil Material by the Wind, which deals very fully with the subject of atmospheric dust, and is accompanied by a well-nigh exhaustive bibliography of this subject. Secular changes of climate during the post-glacial period form the subject of a large volume of reports by numerous collaborators, issued under the direction of the Eleventh International Geological Congress. (Die Veränderung des Klimas seit dem Maximum der letzten Eiszeit, Stockholm, 1910.)

Climatology was represented by the second and final volume of J. Maurer's Das Klima der Schweiz (Frauenfeld, 1910); Tetens and Linke's Das Klima von Samoa (Berlin, 1910); O. L. Fassig's Climate of Porto Rico (extracted from Register of Porto Rico, 1910, San Juan, 1911); a second part of G. Hellmann's Das Klima von Berlin (Berlin, 1910); F. Eredia's La Temperatura in Italia (Rome, 1911); and fully a score of other valuable publications. The third volume of Hann's Klimatologie, mentioned above, was, however, the all-important climatographic publication of the year. It deals with the climates of the temperate and polar zones.

General works on meteorology have recently been published in Russian, Spanish, Dutch, and modern Greek, by Voeikov, Oliver, Gulik, and Eginitis, respectively.

EXAMINATIONS FOR PROMOTION.

The total number of examination papers received and rated during the year was 295, as compared with 258 during the preceding year. Following is the record in detail:

Subject.	1910		1911		Total.	Passed.	Failed.
	August.	November.	February.	May.			
English grammar.....	7	12	9	8	36	20	16
Arithmetic.....	6	14	10	3	33	26	7
Elementary meteorology.....	6	12	9	3	30	23	7
Essay writing.....	7	13	11	18	49	34	15
Algebra.....	6	13	10	11	40	30	10
Physics.....	4	9	5	11	29	21	8
Trigonometry.....	3	6	4	5	18	15	3
Astronomy.....	8	1	3	7	19	19	0
Plant physiology.....	8	3	4	7	22	21	1
Advanced meteorology.....	7	1	3	8	19	17	2
Total.....	62	84	68	81	295	226	69

TELEGRAPH DIVISION.

The various telegraph and telephone lines owned and operated by the Weather Bureau have been maintained in good condition at a total outlay of less than \$500 for minor repairs.

The Block Island-Narragansett section, which extends from the island to Narragansett Pier, has worked excellently and with little interruption during the entire year.

The Norfolk-Hatteras line was down for 29 days, but Hatteras weather reports failed to get through on time on only 15 days, the

life-saving telephone being used at other times of interrupted service. The loop between Cape Henry and Virginia Beach was changed from Western Union telegraph poles to Government poles during the year. The entire section was inspected by the chief operator in May. Proper recommendations were made and approved by the central office, including the purchase at a cost of \$1,182.72 of 1 $\frac{3}{4}$ miles of new cable, to replace an old and defective cable at New Inlet, N. C. General work necessary to put the section in excellent condition will shortly be made. The life-saving crews from Cape Henry to Hatteras have rendered valuable assistance in making all minor repairs.

The submarine cable from Key West to Sand Key, Fla., was interrupted for two days during the month of February, due to temporary trouble in the terminal trench at Key West end.

The Alpena-Thunder Bay and Middle Island, Mich., section has worked well, with but 36 hours of interrupted service during the year.

The Beaver Island section, from Charlevoix to St. James, Mich., was uninterrupted during the entire year, and was maintained without any expense to the bureau for repairs.

The Glen Haven-South and North Manitou Islands, Mich., section was thoroughly overhauled during September and October, 1910, and placed in first-class condition by a lineman detailed from the Life-Saving Service. In March, 1911, a landslide at South Manitou Island carried away a portion of the shore end of the cable, burying it in the sand to such a depth that 1,700 feet had to be abandoned. Extra cable was shipped from Charlevoix, Mich., and, through the cooperation of the Life-Saving Service, the necessary repairs were made and cable service restored on May 31. Repairs were made at the time to the cable box on North Manitou Island, restoring service between that island and South Manitou; also to the telephones at Glen Haven and Sleeping Bear Life-Saving Station. The line, cable, and instruments between Glen Haven, South Manitou, and North Manitou Islands are now in good working order.

The line from San Francisco to Point Reyes has been placed in good condition at a small expense.

Communication between Port Crescent and Tatoosh was interrupted during the year for a total of 14 days. Communication between Port Crescent and Seattle on the Western Union line was also interrupted for 39 days, and on the Postal wire for 55 days.

The Government receipts from all lines for commercial messages handled during the year amounted to \$2,018.48.

PUBLICATIONS DIVISION.

The Publications Division has continued to issue the regular publications of the bureau, consisting of the Monthly Weather Review, the Bulletin of the Mount Weather Observatory, the National Weather Bulletin, the Snow and Ice Bulletin, the Marine Meteorological Charts, the Weather Maps, and the forecast cards. It has also supplied the stations with blank forms, for their meteorological and other station work, and blank maps and cards for disseminating weather forecasts.

On January 1, 1911, most of the printing material, including power and job presses, monotype machines, and type, was transferred to the Government Printing Office, where the actual printing work of the bureau has since been done, with the exception of the daily weather maps, and cards for the local forecasts, and such small

supplies as have been needed for immediate use at the central office. Lithographic operations remain unchanged.

As a result of this change in the printing work of the bureau the services of 16 employees in its printing office were dispensed with at the close of the year, 9 being transferred to the Government Printing Office. Seven rooms on the second floor of the quarters previously occupied have also been vacated, and all printing work is now confined to the first floor.

DIVISION OF SUPPLIES.

The reclassification of property recommended by the board of survey went into effect on June 1, 1911. This classification eliminates the group formerly designated "Y" property, which, after becoming unserviceable from use, could be dropped from the returns without special authority. Under the new system only such articles can be dropped as are actually consumed by use or that are of slight value and soon worn out in service.

The equipment of 55 stations with chalk plate and stereotyping outfits for use in casting plates for commercial maps was completed during February, 1911. At a few of these stations the publication of the maps in the daily papers has since been discontinued, but the spare equipment has all been utilized in supplying other map-making offices.

New glass weather maps for public display were contracted for and installed as follows: Two in the United States Capitol and one each at Fort Smith, Ark.; Boston, Mass.; Indianapolis, Ind.; Richmond, Va.; Cincinnati, Ohio; Wichita, Kans.; Vicksburg, Miss.; and Peoria, Ill.

All regular stations and all substations issuing daily forecast cards were supplied with improved logotype outfits during the year. Besides a much enlarged vocabulary of weather terms, with standard captions and dates, each new outfit for regular stations includes a hand-printing press that produces excellent impressions in much smaller and neater type than that formerly used on forecast cards. Substations were supplied with new hand-stamping outfits, consisting of a modified vocabulary and type holders of new and improved pattern. These new outfits are superior in every respect to the old stamping devices, and are the result of considerable experimental work conducted in this division with a variety of apparatus submitted by manufacturers.

OBSERVATORY BUILDINGS.

No new observatory buildings were authorized during the year, except the reconstruction of the building at Sand Key, Fla., to replace the one that was destroyed by the hurricane of October 11, 1909. This building is now in course of construction, but the work has been unusually difficult, because the key was practically washed away by the hurricane of October 17, 1910. The building site is now completely under water, which fact has materially retarded the work. However, the key is gradually re-forming, and it is expected that in a year or two it will have assumed its previous size. It is probable that the building will be finished and ready for occupancy by or before October 1, 1911. During the building operations the Weather Bureau employees are occupying a room in the lighthouse and the work of the bureau is being conducted without interruption.

The same hurricane that washed away Sand Key damaged the observatory building at Key West so badly that it is necessary to replace it. Congress has appropriated \$15,000 for the purpose, and it is expected that the building will be completed by March 1, 1912.

The following table shows where the buildings owned by the Weather Bureau are located, the fiscal years in which they were erected, and the cost of the buildings and grounds:

Buildings owned by the Weather Bureau.

Location.	Erected.	Cost of ground.	Cost of buildings.	Total cost.
Abilene, Tex.....	1909	\$2,000.00	\$12,841.81	\$14,841.81
Amarillo, Tex.....	1903	1,255.00	6,503.00	7,758.00
Anniston, Ala.....	1907	1,799.75	12,920.69	14,720.44
Atlantic City, N. J.....	1902	(1)	5,991.00	5,991.00
Bentonville, Ark.....	1906	500.00	5,119.90	5,619.90
Birmingham, Ala.....	1907	2 61.50	15,630.36	15,691.86
Bismarck, N. Dak.....	2 1899	(1)	10,085.99	10,085.99
Block Island, R. I.....	1904	1,034.50	7,665.25	8,702.75
Burlington, Vt.....	1906	2 20.00	10,043.50	10,063.50
Canton, N. Y.....	1909	2 1.35	14,135.20	14,136.55
Cape Henry, Va.....	1902	(1)	9,222.45	9,222.45
Charles City, Iowa.....	1907	3,036.75	9,338.47	12,375.22
Columbia, S. C.....	1905	3,799.00	9,165.00	12,964.00
Devils Lake, N. Dak.....	1904	2,209.05	7,431.50	9,640.55
Dodge City, Kans.....	1909	2,050.00	10,837.62	12,887.62
Duluth, Minn.....	1904	2,041.70	7,430.68	9,472.38
East Lansing, Mich.....	1909	2 11.35	12,781.04	12,792.39
Hatteras, N. C.....	1902	1 217.00	4,889.75	5,106.75
Hayre, Mont.....	1904	1,795.00	5,087.08	6,882.08
Iola, Kans.....	1907	2,241.25	9,730.94	11,972.19
Jupiter, Fla.....	1902	(1)	6,346.90	6,346.90
Key West, Fla.....	1903	2,020.00	7,994.75	10,014.75
Kittyhawk, N. C.....	2 1902	(1)	1,616.00	1,616.00
La Crosse, Wis.....	1907	3,523.50	12,276.24	15,799.74
Modena, Utah.....	1903	(1)	4,346.00	4,346.00
Mount Weather, Va.:				
Administration Building.....	1909	1,863.15	48,035.26	49,898.41
Machine shop and balloon shed.....	1904	650.00	8,167.00	8,817.00
Central heating and power plant.....	1909	(1)	11,964.74	11,964.74
Absolute building.....	2 1906	(1)	7,000.00	7,000.00
Variation building.....	2 1906	(1)	8,904.55	8,904.55
Stable.....	1903	(1)	1,900.00	1,900.00
Barn.....	1905	(1)	900.00	900.00
Cottage for workmen.....	2 1905	(1)	1,300.00	1,300.00
Physical laboratory.....	2 1909	(1)	37,521.51	37,521.51
Cottage and office.....	2 1909	(1)	11,246.34	11,246.34
Nantucket, Mass.....	1905	(8)	4,728.53	4,728.53
Narragansett Pier, R. I.....	1904	4,151.75	8,036.50	12,188.25
Northfield, Vt.....	1909	2 101.00	12,795.64	12,896.64
North Head, Wash.....	1902	(1)	3,820.13	3,820.13
North Platte, Nebr.....	1906	(8)	3,818.50	3,818.50
Oklahoma, Okla.....	1906	2 38.90	10,520.25	10,559.15
Peoria, Ill.....	1905	2 54.00	7,875.50	7,929.50
Point Reyes Light, Cal.....	1902	(1)	2,875.00	2,875.00
Port Crescent, Wash.....	1902	102.00	730.94	832.94
Richmond Va.....	1909	2 8.75	15,489.01	15,497.76
St. Joseph, Mo.....	1909	5,040.95	16,882.80	21,923.75
Sand Key, Fla.....	1903	(1)	2 14,800.00	2 14,800.00
Sault Ste. Marie, Mich.....	1899	(1)	2,994.12	2,994.12
Sheridan, Wyo.....	1907	2,021.75	12,089.30	14,111.05
Southeast Farallon, Cal.....	1903	(1)	5,211.22	5,211.22
Springfield, Ill.....	1906	(1)	10,236.50	10,236.50
Tatoosh Island, Wash.....	1902	(1)	5,000.00	5,000.00
Washington, D. C.....	.....	(8)	174,950.79	174,950.79
Yellowstone Park, Wyo.....	1904	(1)	11,156.00	11,156.00
Yuma, Ariz.....	2 1903	(1)	1,500.00	1,500.00
Total.....		43,648.95	681,884.25	725,533.20

¹ Government reservation.

² Remodeled.

³ Donated; figures represent cost of title transfer.

⁴ Additional ground purchased.

⁵ Begun in 1905.

⁶ Begun in 1903.

⁷ Begun in 1907.

⁸ Building and ground purchased as a whole.

⁹ Estimated cost of new building now in course of construction.

Buildings rented by the Weather Bureau for living and observatory purposes.

Station.	Annual rent.	Other items included.
Alpena, Mich.....	\$650	Heat, light, water.
Cape May, N. J.....	650	
Clallam Bay, Wash.....	120	Water.
Del Rio, Tex.....	444	Heat, light, water.
Durango, Colo.....	318	Water.
Flagstaff, Ariz.....	420	
Helena, Mont.....	624	Steam heating plant, water.
Honolulu, Hawaii.....	1,020	6 rooms; heat, cleaner, light, janitor and porter service, electric current for fan, storage.
Independence, Cal.....	456	Water for domestic and irrigation purposes, and the trimming and care of all trees on the premises
Kalispell, Mont.....	360	
Lewiston, Idaho.....	540	
Manteo, N. C.....	144	
Moorhead, Minn.....	600	Heat, light, water.
Mount Tamalpais, Cal.....	420	Heat, light, water, and the free transportation of Government employees and supplies.
Pysht, Wash.....	144	Water.
Roseburg, Oreg.....	550	Heat, light, water.
Roswell, N. Mex.....	720	Heat, cleaner, light.
San Juan, P. R.....	600	10 rooms.
Thomasville, Ga.....	420	
Tonopah, Nev.....	840	
Twin, Wash.....	108	Water.
Winnemucca, Nev.....	480	Heat, light, water.
Total.....	10,628	

PERSONNEL OF THE BUREAU.

The numerical strength of the Weather Bureau at the close of the year was 9,483, as compared with 6,895 at the end of the preceding 12 months. This unusual increase is apparent rather than real, however, since the total owes its enlargement almost entirely to the inclusion of 2,416 marine meteorological observers who have hitherto not been considered in the enumeration. Of the total number, 7,390, or nearly 80 per cent, are cooperative observers rendering service without compensation other than that received through the free distribution of Government publications.

The total number of commissioned employees at the end of the year, 776, was 16 less than at the close of the preceding year. This decrease has been brought about largely through a lessening of the central office force by 25, owing to the discontinuance of a large portion of the printing work. The actual number of commissioned employees at stations, however, was 9 greater at the close of the year than at the time of the last report.

The formation of the new Division of Observations and Reports practically absorbed the central office clerical force formerly engaged in the duties performed by the Marine, Forecast, River and Flood, and Distributing Divisions. The force in the remaining divisions has been increased slightly in some instances, with the exception of the marked reduction in the Publications Division, already mentioned.

The enlargement of the commissioned force in the field by 9 was necessitated through the establishment of new stations at Dayton, Ohio, Fort Wayne, Ind., and Miami, Fla. At the stations already in existence the working force was lessened by 1 at seven points, in order to meet the demands for additional help at other stations where the service rendered the public had become greatly expanded. The rearrangements thus effected, both at the central office and in the

field, have had for their sole object the performance of a maximum amount of work with a minimum number of employees.

The number of permanent appointments in the classified service during the year, including those effected by transfer and reinstatement, was 37 less than in the preceding year. The temporary appointments were 22 less. During the same period the promotions, amounting to 172, were also less by 29. All promotions were to the next higher grade, with but one exception, that of an official assigned to a newly established station where the responsibilities of his position were much greater than at the station formerly held.

The number of voluntary resignations in the classified service during the year was 70, or 17 more than in the previous year. Of this number 31 were in the grade of messenger and messenger boy, and 15 were recently appointed assistant observers. The loss in the messenger service is naturally to be looked for as the boys advance toward manhood. The inability to hold all of the new assistant observers is doubtless due to the small salary paid them during the first year or two of their service. At the present rate of wages young men of their attainments are able to command, the temptation to engage in employment giving more lucrative immediate returns than those offered in the lower grades of the Government service, has often proved irresistible.

Of the 69 probationary appointments made, only 2 failed to complete successfully the 6 months' probationary period. There were 9 forced resignations from the classified service, for various causes, during the year, while the removals for reasons reflecting upon the character of the employees were 3. Of the 14 reductions during the year, 6 were brought about through causes reflecting in no manner upon those reduced, while 8 suffered a decrease in salary for failure to measure up to the standards of efficiency and conduct required by the bureau.

In the unclassified service there were 5 permanent and 2 temporary appointments, as compared with 5 permanent and no temporary appointments in the preceding year.

The absence record for the service as a whole showed a fraction of a day more sick leave and a fraction of a day less annual leave for each employee than in the preceding year.

There were 4 deaths in the commissioned force during the year, as compared with 8 for the year before. Among these was Mr. Jesse H. Robinson, chief of the Telegraph Division at the central office of the Weather Bureau, in whose death on May 1, 1911, the bureau sustained the loss of a valued official. Mr. Robinson entered the service on March 6, 1872, and was appointed chief operator in 1891, and chief of the Telegraph Division in 1902.

CHANGES IN THE FORCE OF THE BUREAU.

CLASSIFIED SERVICE.

Appointments:

Probationary—

Compositor, at \$1,250.....	1
Skilled mechanics, at \$1,200.....	2
Clerk, at \$1,000.....	1
Clerk, at \$900.....	1
Copyists, at \$840.....	2
Assistant observer, at \$840.....	1
Copyist, at \$720.....	1
Assistant observers, at \$720.....	18
Skilled mechanic, at \$720.....	1
Repairman, at \$720.....	1
Messenger, at \$480.....	1
Messenger boys, at \$450.....	7
Messenger boys, at \$360.....	32

69

Transfer:

Assistant observer, at \$1,000.....	1
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Reinstatement:

Section director, at \$1,800.....	1
Assistant observer, at \$1,000.....	1
Printer, at \$1,000.....	1
Assistant observer, at \$840.....	1
Assistant observer, at \$720.....	1
Messenger, at \$600.....	1

6

Temporary:

Compositor, at \$1,250.....	1
Skilled mechanic, at \$1,200.....	1
Skilled mechanic, at \$1,000.....	1
Repairman, at \$720.....	1
Folders and feeders, at \$630.....	2
Messenger, at \$480.....	1
Messenger boys, at \$360.....	20

27

Promotions (all promotions except 1 were to the next higher grade or by certification for advancement from subclerical positions).....	172
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Reductions:

Causes—

To grant assignment to preferred station.....	1
To grant assignment to preferred work.....	2
As an offset to the bureau for allowance of quarters, fuel, and light.....	2
Necessitated by change of duties.....	1
Unsatisfactory administrative work.....	1
Unsatisfactory services.....	4
Neglect of duty.....	1
Unsatisfactory conduct and neglect of duty.....	2

14

Resignations:

Voluntary.....	70
Required because of—	
Unsatisfactory services.....	3
Unsatisfactory conduct.....	1
Unsatisfactory service and conduct.....	1
Absence without authority.....	1
Nonpayment of debts.....	1
Physical unsuitability for Weather Bureau work.....	1
Refusal of tendered assignment.....	1

79

Transferred to the Division of Publications, Department of Agriculture..... 2

Removals:

Causes—

Transfer of certain printing work from the Weather Bureau to the Government Printing Office.....	7
Continued illness.....	1
Neglect of duty and unsatisfactory services.....	1
Intoxication and neglect of duty.....	1
Intemperance and absence without authority.....	1
Legally adjudged insane.....	1

12

Dropped from the rolls at termination of probationary period because of unsatisfactory services..... 2

Deaths..... 4

UNCLASSIFIED SERVICE.

Appointments:

Permanent—

Unclassified laborers, at \$480.....	3
Student assistants, at \$300.....	2

5

Temporary—

Student assistant, at \$300.....	1
Charwoman, at \$240.....	1

2

Promotions (to the next higher grade)..... 2

Resignations: Voluntary..... 5

ABSENCE.

Average number of days per employee during calendar year 1910.

	Sickness.	Annual leave.
Station (99 per cent males).....	1.5	6.8
Washington, D. C.:		
Males.....	4.6	23.4
Females.....	10.2	27.3
Entire service.....	2.4	11.2

STATISTICS OF THE SERVICE.

The following tables show the numerical strength of the bureau, and the highest, lowest, and average salaries paid in the commissioned grades:

Numerical strength of the Weather Bureau, June 30, 1911.

At Washington, D. C.:		
Classified.....	174	
Unclassified.....	11	185
Outside of Washington, D. C.:		
Classified.....	579	
Unclassified.....	12	591
Total commissioned employees.....		776
Additional employees outside of Washington, D. C.:		
Storm-warning displaymen.....	183	
River observers.....	383	
Cotton-region observers.....	125	
Corn and wheat region observers.....	134	
Rainfall observers.....	110	
Sugar and rice region observers.....	7	
Special meteorological observers.....	82	
Special cranberry-marsh observers.....	8	
Special snow and ice observers.....	4	
Mountain snowfall observers.....	281	
Total noncommissioned employees.....		1,317
Total paid employees.....		1,2,093
Persons serving without compensation (except through the distribution of Government publications):		
Cooperative observers and correspondents (omitting 412 paid observers enumerated elsewhere).....	4,847	
Cooperative storm-warning displaymen.....	96	
Cooperative river observers.....	22	
Cooperative rainfall observers.....	9	
Marine meteorological observers.....	2,416	
Total cooperatives.....		7,390
Total numerical strength.....		9,483

Distribution of the commissioned force, June 30, 1911.

In Washington, D. C.:	
Accounts Division.....	14
Climatological Division.....	17
Executive branch.....	19
Forecasting.....	2
Instrument Division.....	11
Library.....	5
Observations and Reports, Division of.....	26
Observatory.....	1
Publications Division.....	24
Supplies Division.....	11
Telegraph Division.....	11
Verification section.....	2
Drafting room (under direction of the chief clerk).....	4

¹ This total embraces all paid persons connected with the bureau on June 30, 1911, except 14 commissioned employees, absent on that date and who had been granted leaves of absence or furloughs without pay for one month or more.

² One employee devotes a portion of his time at one of the map stations at the United States Capitol.

In Washington, D. C.—Continued.

Heat, light, and power plant (under direction of the chief clerk).....	5
Miscellaneous mechanical work (under the direction of the chief clerk)..	6
Watch force (under direction of the chief clerk).....	6
General messenger and laborer service (under direction of the chief clerk).	21
Total.....	185

Outside of Washington, D. C.:

53 stations with 1 commissioned employee.....	53
45 stations with 2 commissioned employees.....	90
50 stations with 3 commissioned employees.....	150
18 stations with 4 commissioned employees.....	72
14 stations with 5 commissioned employees.....	70
7 stations with 6 commissioned employees.....	42
5 stations with 7 commissioned employees.....	35
2 stations with 8 commissioned employees.....	16
3 stations with 9 commissioned employees.....	27
1 station with 10 commissioned employees.....	10
1 station with 12 commissioned employees.....	12
1 station with 23 commissioned employees.....	23
200 stations.....	1 600

In addition to the foregoing there are eight special observing (one man) stations in the West Indies, mainly in operation during the hurricane season, and a special repair station in Washington operated from October to April, inclusive.

The following salary table omits persons on duty at special observing and substations where the salaries are \$25 a month or less, and where, as a rule, the tour of duty covers but a small fraction of the day and only certain seasons of the year.

Salaries paid in the commissioned grades.

Grades.	June 30, 1911.	
	Stations.	Washington, D. C.
Classified grades:		
Highest salary.....	\$3,500	\$6,000
Lowest salary.....	360	450
Average salary.....	1,046	1,173
Unclassified grades:		
Highest salary.....	720	720
Lowest salary.....	300	240
Average salary.....	405	513

Average salary of all (station and Washington) is \$1,057.

This represents the normal station force. On June 30, 1911, there were actually on duty 591 employees.

REPORT OF THE CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., October 3, 1911.

SIR: I have the honor to transmit herewith a report of the operations of the Bureau of Animal Industry for the fiscal year ended June 30, 1911.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

INTRODUCTION.

The bureau deals with the live-stock industry in a threefold way, comprising administrative, research, and educational work. This work includes the inspection of animals, meat, and meat food products in connection with interstate and export business under the law of June 30, 1906; the inspection of animals for export; the inspection and quarantine of imported animals; the eradication of contagious and infectious diseases of live stock; the scientific investigation of such diseases; investigations in the breeding and feeding of live stock and poultry; work relating to the dairy industry, and the diffusion of information on these subjects.

The number of employees in the service of the bureau on July 1, 1911, was 3,284, as compared with 3,183 a year before.

After a brief general discussion of certain features the work of the various divisions of the bureau's organization will be presented in order and more in detail.

STUDY AND ERADICATION OF ANIMAL DISEASES.

The work of controlling and eradicating certain contagious and infectious diseases of live stock has been carried forward with very favorable results.

Since the summer of 1906 the bureau has been engaged, in cooperation with the State and local authorities, in the extermination of the ticks which inhabit the Southern States and which spread the infection of the disease known as southern or Texas fever of cattle and otherwise handicap the cattle and dairy industries by keeping animals in poor condition. Good progress was made in this under-

taking during the past fiscal year, as a result of which areas aggregating 10,965 square miles were released from quarantine, making the total territory so released since the beginning of the work 139,821 square miles. This territory is mostly along the northern border of the infected region, extending from Virginia to California.

Experiments in dipping cattle for the destruction of the ticks have shown that arsenical solutions are more satisfactory than the Beaumont crude petroleum which has heretofore been used to a considerable extent. Arsenical dips are therefore now being principally employed in the work of tick eradication, and articles have been prepared for publication reporting the results of the dipping experiments and giving directions for the preparation and use of arsenical dips and for the construction of dipping vats. A paper discussing the history and progress of the work of tick eradication has also been prepared for the Twenty-seventh Annual Report of the Bureau.

Substantial progress was also made during the fiscal year in the eradication of the parasitic diseases known as sheep scab and cattle mange. Statistics of this work, as well as of tick eradication, appear in the portion of this report dealing with the work of the Inspection Division. In addition to the territory released from quarantine, the amount of infection in some of the areas remaining under quarantine has been considerably reduced.

The form of necrobacillosis known as lip-and-leg ulceration of sheep, which has been quite prevalent in a malignant form in a large part of Wyoming and Montana within the past three years, was brought under control so well during the fiscal year as a result of work done by the bureau and State officers, with favorable climatic conditions, that the Federal quarantine was entirely released under date of August 10, 1911. While the disease is still sometimes found in a mild form, it is believed that ordinary methods of State and interstate inspection will be sufficient to keep it under control. It is fortunate for the sheep industry that the malignant form of the disease was stamped out within such a short time and not allowed to spread extensively throughout the West.

The recurrence of the contagious disease known as dourine of horses was an incident of the year. This disease had apparently been completely eradicated a few years before as a result of several years' work by the bureau. The new outbreak occurred in Iowa, and while the manner in which the infection was again introduced has not been positively determined, all the information at hand points to its having been brought in with an imported stallion. Prompt and vigorous action by the bureau in concert with the State authorities has resulted in the practical eradication of the contagion. In studying the disease the scientists of the bureau were able to find under the microscope the living organisms which are the infective agent, this being the first discovery of the organism in natural cases in the United States. Further details of the outbreak and its study and eradication are given in the report of the Pathological Division.

Although mallein has been in use for the diagnosis of glanders for several years, it has not been entirely reliable. During the year the bureau scientists have made a special study of a new laboratory test for glanders known as the complement-fixation test, and the first description of this test published in the United States was issued as a bulletin of the bureau. The new test has been found to be highly

accurate and reliable and affords a very valuable means of determining doubtful cases of glanders in horses and of bringing about its eradication.

TUBERCULOSIS.

Tuberculosis has continued to be a subject of both administrative work and scientific investigation. In 1909 and 1910 a systematic tuberculin test was made of all cattle in the District of Columbia, and those that reacted were slaughtered. During the past fiscal year the bureau has been engaged in making retests at intervals in order to detect the disease in any animals in which it might have developed since the first test. This work is described in the report of the Quarantine Division. Only a small proportion of cases is now being found, and as all cattle brought into the District except for immediate slaughter have to undergo the test, it is believed that the District will soon be entirely freed from bovine tuberculosis.

Experiments in the immunization of cattle against tuberculosis by means of vaccination have been continued, and while some encouraging results have been obtained, the only methods that appear to be at all reliable require the use of living tubercle bacilli, and the bureau does not yet consider such methods adapted to practical use because of the danger of spreading the disease. This work has been made the subject of a special article in the Twenty-seventh Annual Report of the bureau.

For several years the bureau has advocated that only animals that are free from tuberculosis should be admitted to public exhibitions. Following this recommendation the officials of the Utah State Fair last year made a ruling which permitted only cattle which were free from tuberculosis as demonstrated by the tuberculin test to be shown at that fair. It is hoped that the managers of other large exhibitions will follow a similar course. This policy seems desirable for two reasons, first, because if tuberculous animals are admitted there is danger that the disease will be spread to other stock, and second, it seems unreasonable and unfair that premiums should be awarded to animals that are infected with a contagious disease. The smallest blemish will disqualify a horse in the show ring, and it seems only logical that the presence of a contagious disease should disqualify cattle. Certainly the owners of healthy stock should not be expected to expose their animals to diseased ones at these fairs.

About two years ago a special committee known as the International Commission on the Control of Bovine Tuberculosis was appointed by the American Medical Veterinary Association to study the tuberculosis problem in live stock and to formulate measures for dealing with it. The report of this commission was submitted during the past fiscal year, and owing to its importance and the desirability of giving it a wide distribution it was published by the department as a circular of this bureau. The commission has since prepared a simple and concise treatise on this disease, intended especially for farmers and stock raisers, and it is expected that this will be published by the department as a Farmers' Bulletin. As a proper understanding of the nature of tuberculosis and the best means for dealing with it are essential to the success of any undertaking for the control or eradication of this disease, it is believed that the widespread distribution of this literature will accomplish great good.

NEW EXPERIMENTAL FARM AND QUARANTINE STATIONS

As stated in my last report, a farm of about 475 acres, located at Beltsville, Prince George County, Md., about 13 miles from Washington, was purchased under an appropriation made by the appropriation act for the Department of Agriculture for the fiscal year ending June 30, 1911. This farm was intended for experimental work in animal husbandry and dairying. For several years it had been considered very desirable to separate work of this kind from that relating to infectious diseases as carried on at the Bureau Experiment Station at Bethesda, Md. During the past year considerable work in the way of building, fencing, and equipping the Beltsville farm for work for which it is intended has been carried on, and the work of breeding and feeding animals and poultry has been transferred there from the Bethesda Station.

With an appropriation of \$65,000 made by Congress two quarantine stations have been purchased, to replace rented ones, for the detention of imported animals brought in at the ports of Boston and Baltimore. The station for Boston is located at Littleton, Mass. The Baltimore station is located on the water front and makes it possible to transfer live stock by lighter directly from the steamer to the station.

BREEDING HORSES FOR THE UNITED STATES ARMY.

As pointed out somewhat at length in my last report, there is great need for the Government to undertake some systematic plan for encouraging the breeding of horses of a type suitable for Army use. The breeding of this type of horse is declining rapidly in favor of breeding heavier horses, and it is becoming evident that if the Army is to be able to procure an adequate number of suitable horses in the future some plan such as has been recommended will have to be entered into. During the year a hearing on this subject was held by the Committee on Agriculture of the House of Representatives, but no special appropriation for such work was made by Congress. However, the bureau has made a small beginning, the slight expenses of the work being paid from the appropriation for animal feeding and breeding experiments. During the year Mr. August Belmont presented to the War Department two well-known Thoroughbred stallions, Henry of Navarre and Octagon, and, at the request of the Secretary of War, the Department of Agriculture consented to take the stallions and stand them for public service under the provisions of the plan outlined in the preceding report. The stallions are at the remount station of the Army at Front Royal, Va., and have been bred to about 50 mares, each mare owner agreeing to give the Government an option on the foal at three years at \$150 in return for stallion service. The conditions for service also provide for disqualifications for faulty gait and conformation and unsoundness.

VETERINARY EDUCATION.

In order to obtain qualified veterinarians for its service, the bureau, in conjunction with the United States Civil Service Commission, has continued its investigations and supervision with regard to the courses of study and facilities for instruction at veterinary colleges. This work may be better understood from a brief review, including the circumstances leading up to it.

The veterinary inspectors of the bureau were placed in the classified service by Executive order dated May 28, 1894, and the first examination was held by the Civil Service Commission June 22, 1894. To be eligible for the examination the only restriction made was that the applicant should be a graduate of a veterinary college. This remained in effect until July 1, 1899, when the standard was raised and the requirement made that the applicant should be a graduate of a veterinary college having a course of not less than three years. This was changed in January, 1900, to the requirement that veterinarians were eligible who were graduated during or prior to 1897 from veterinary colleges having a course of two years, while those graduated after that date must be from colleges having a course of three years. This standard was modified again in January, 1903, by requiring that applicants from a veterinary college having a course of three years must have spent at least two years in the study of veterinary science at a veterinary college. The necessity for this provision arose from the fact that certain veterinary colleges inaugurated the custom of giving degrees after one year of attendance and allowed two years' credit for time previously spent at agricultural, medical, or other colleges.

The demand for veterinarians for employment in practice and in the work of the bureau was so great that the existing veterinary colleges were not able to supply the requisite number. Some colleges did not give sufficient attention to the preliminary education of the students enrolled and were not particular as to the scope of the instruction given, the number of branches taught, and the length of the course. For this reason it was found that although some of the graduates were able to pass the somewhat restricted civil-service examination, a considerable number were not sufficiently educated to make satisfactory inspectors and were not professionally qualified for the important duties assigned to them.

Accordingly it was deemed advisable to adopt some means to designate the course of study, as an adjunct to the examination, which should be provided by colleges that wished to prepare graduates for the civil-service examination for veterinary inspector. In order to obtain expert advice as to the subjects to be included in a proper curriculum and the amount of time (number of hours) to be devoted to each, the Secretary of Agriculture in February, 1908, appointed five representative and qualified veterinarians as a committee on veterinary education, for the purpose of obtaining information regarding the course of instruction then given at veterinary colleges and to make recommendations as to the matriculation examination and the course of instruction necessary to qualify graduates of these colleges for admission to the civil-service examination for the position of veterinary inspector in the Bureau of Animal Industry.

This committee visited the various colleges for the purpose of obtaining the desired information, and as a result of its inquiry made recommendations as published in Circular 133 of the Bureau of Animal Industry. This circular was distributed generally, and most of the veterinary colleges proceeded at once to put the recommendations into effect.

On January 21, 1909, on my invitation a conference of representatives of all the veterinary colleges of North America met at Washington to consider with the committee above mentioned the whole matter

of matriculation and course of study. The committee's recommendations in the main were heartily approved by the conference, but it was decided to reduce the total number of hours in the course from 3,200, as required by Circular 133, to 3,000. By this reduction the student is still required to have instruction for an average of $6\frac{2}{3}$ hours per day for 6 days per week for 25 weeks for 3 years in order to cover the required 3,000 hours. The Association of American Medical Colleges recommends in colleges for the study of human medicine a curriculum of $33\frac{1}{3}$ hours per week, while the present regulations for veterinary colleges require for day colleges $38\frac{2}{3}$ hours per week and for night colleges $29\frac{2}{3}$ hours per week. While night instruction is discouraged and has been practically discontinued by all but two colleges, it was deemed advisable to make provision for it, as there seemed to be a demand for classes after office or work hours, particularly in Washington. It was therefore decided to fix the course for night colleges at $8\frac{1}{2}$ months, exclusive of final examination and holidays, as compared with $6\frac{1}{2}$ months for day colleges.

In March, 1909, there was appointed within the Bureau of Animal Industry a committee on veterinary education, consisting of Dr. A. M. Farrington and Dr. R. W. Hickman. This committee, commencing on March 17, 1909, visited all the veterinary colleges and made an inspection of each, obtaining all possible information regarding the manner in which each college was complying or failing to comply with the recommendations of Circular 133. A confidential report was sent to each college visited, stating wherein, in the opinion of the committee, improvements could be made and deficiencies corrected. Their reports were well received, and marked improvement has resulted in the curriculums of many colleges.

In the efforts to secure suitable veterinary inspectors properly qualified and educated in the veterinary profession there has been active cooperation of the United States Civil Service Commission, which brought about the issuance of regulations governing entrance to the veterinary inspector examination, effective September 1, 1909, approved conjointly by the Secretary of Agriculture and the president of the commission. These regulations were published as Bureau of Animal Industry Circular 150, which contains a list of the accredited veterinary colleges, graduates of which can be enrolled for the veterinary inspector examination. This list is subject to change, and any college failing to comply with the requirements is removed from the list until such time as there is faithful and explicit compliance.

The result of these measures has been not only to make it possible for the bureau to obtain men better educated and qualified for its veterinary work, but to raise the standard of veterinary education in the United States and to provide students with larger and better facilities for study. Many of the veterinary schools have made large expenditures of money and have greatly augmented and improved their equipment and facilities since the regulations were issued. The majority of the schools have cooperated heartily with the bureau in bringing about improvement and have cheerfully complied with the official requirements. The officials of several schools have expressed their appreciation of the bureau's efforts and their desire that its supervision should be continued, and some have said that until they found it necessary to make certain improvements in order to meet the bureau's requirements they had not realized that their schools were deficient in those particulars.

The department assumes no direct authority or control over the veterinary colleges; it merely undertakes, in conjunction with the Civil Service Commission, to prescribe certain requirements for admission to the examinations for veterinary positions in its own service with a view to obtaining the services of qualified men. In order for the graduates of a college to be eligible to such positions the college must provide the required facilities for instruction.

NEEDED LEGISLATION.

As indicated in previous reports, further legislation by Congress is needed in order to enable the department to exercise efficient control over certain matters in the interest of the live-stock industry and for the public good.

With the growing use in veterinary practice of vaccines, serums, antitoxins, tuberculins, and other preparations for the detection, prevention, or treatment of diseases of animals, and the increasing imports of such products, there is constant danger that contagious diseases may be introduced from abroad and cause great damage, as happened a few years ago in the outbreaks of foot-and-mouth disease. Furthermore, these preparations, as shown by the bureau's investigations, are sometimes lacking in potency or are not standardized. It therefore seems very desirable that the Secretary of Agriculture should be given legal authority to control the importation of such products and to supervise the preparation of those manufactured in this country for interstate commerce, such authority to be similar to that already vested in the United States Public Health and Marine-Hospital Service with regard to similar products for use in human medicine.

The need for legislation to enable the department to regulate more effectively the interstate transportation of live stock so as to prevent the spread of contagious diseases and provide more humane conditions was set forth in my report for the last fiscal year as follows:

Experience in the enforcement of what is known as the 28-hour law has shown the desirability of exempting in some cases from its operation live stock which is being shipped under quarantine restrictions. Owing to unforeseen delays it is sometimes necessary in order to comply with the law to unload stock which is being shipped under quarantine restrictions into pens which are not specially set apart for that class of stock and which are likely to be used soon afterwards for other stock, and in this way infection has sometimes been spread. This danger could be practically obviated if the Secretary of Agriculture were clothed with power in such cases of emergency to waive the provisions of the law so that animals under quarantine might be kept in the cars for a sufficient time to reach a point where facilities were available for handling them without danger to other stock.

Although existing law authorizes the Secretary of Agriculture to require the disinfection of live-stock cars moving into or out of a section that is quarantined, it is desirable to have this authority extended so as to empower the Secretary of Agriculture to require the disinfection of any live-stock cars used in interstate commerce whenever he may consider such disinfection necessary in order to prevent the spread of disease.

In the shipment of live stock it is sometimes a practice to put into the same car animals of various sizes and different species, with the result that small animals are often injured or trampled to death by larger ones. In order to remedy this evil it is desirable that the Secretary of Agriculture should have authority to regulate the shipment of different classes of stock in the same cars.

Dead animals are sometimes shipped in the same cars with live ones, and there is danger of the spread of disease in this way. Such shipments should be prohibited by law.

There should also be legislation prohibiting the interstate shipment of young calves, which, on account of their inability to eat solid food

and their refusal to drink water, are sometimes kept for several days without nourishment.

TRICHINÆ IN PORK.

As the bureau continued to receive occasional reports of illness following the eating of uncooked or insufficiently cooked pork, it was found desirable during the year to give to the press a statement warning the public against the danger of trichinosis. An average of about 1 per cent of the hogs slaughtered in the United States are infested with the microscopic parasite commonly known as trichina or fleshworm, the scientific name being *Trichinella spiralis*. When transmitted to human beings trichinæ may cause serious illness, sometimes resulting in death.

No method of inspection has yet been devised by which the presence or absence of trichinæ in pork can be determined with certainty, and the Government meat inspection does not include inspection for this parasite. All persons are accordingly warned not to eat pork, or sausage containing pork, whether it has been officially inspected or not, until after it has been properly cooked.

A temperature of about 160° F. kills the parasite, therefore pork when properly cooked may be eaten without any danger of infection. Fresh pork should be cooked until it becomes white and is no longer red in color in all portions of the piece, at the center as well as near the surface. Dry-salt pork, pickled pork, and smoked pork previously salted or pickled, providing the curing is thorough, are practically safe so far as trichinosis is concerned, but as the thoroughness of the curing is not always certain, such meat should also be cooked before it is eaten.

The bureau has for distribution a circular giving information on the subject.

PUBLICATIONS AND DIFFUSION OF INFORMATION.

The results of the bureau's work are made available to the people through publications, correspondence, public addresses, and material furnished to teachers, writers, and the press.

The bureau's new publications issued during the fiscal year numbered 105, aggregating 2,891 printed pages. This is an increase of approximately 25 per cent over the preceding fiscal year. In addition to the new publications there have been numerous reprints of earlier publications. The new publications consisted of the Twenty-sixth Annual Report of the Bureau (for 1909), the Annual Report of the Chief of the Bureau for the fiscal year 1910, 22 bulletins, 19 circulars, 7 Farmers' Bulletins, 5 reprints from the annual report, 2 Yearbook articles, 26 orders and amendments, and 22 miscellaneous publications.

In addition to the distribution of literature, it is necessary to conduct a heavy correspondence to meet the large volume of requests for information.

THE ANIMAL HUSBANDRY DIVISION.

The Animal Husbandry Division, of which Mr. George M. Rommel is chief, deals mainly with the breeding and feeding of live stock and poultry.

HORSE BREEDING.

COLORADO WORK.

The carriage-horse breeding experiments in cooperation with the Colorado Experiment Station have, with one exception, progressed satisfactorily during the past year. The annual culling of inferior individuals is showing its results, and the foals show better quality each year. In August, 1910, the board of survey condemned 8 animals, which were sold at public auction. One mare died during the year; one was destroyed on account of injuries; one foal died, and one was destroyed on account of injuries. The following statement shows the animals in the stud on June 30, 1911:

Ages.	Stallions.	Mares.	Total.
Aged.....	2	25	27
4-year-olds.....	1	5	6
3-year-olds.....	3	3	6
2-year-olds.....	5	4	9
Yearlings.....	11	6	17
Weanlings.....	12	5	17
Total.....	34	43	82

IOWA WORK.

In the experiment in the breeding of gray draft horses in cooperation with the Iowa Experiment Station, 5 out of 8 mares bred in 1910 dropped foals in 1911, and 4 of these foals are living. Two of these foals are by the Shire stallion Dapple Tom out of Clydesdale mares; the others are by the Clydesdale stallion Kuroki out of Shire mares. Three of the foals are gray in color and one is bay. One mare was purchased during the year and added to the stud. All the mares are worked regularly on the farm.

VERMONT WORK.

The Morgan horse-breeding work at Middlebury, Vt., was enlarged during the year by the purchase of the stud of the Willowmoor Farms at Redmond, Wash. There were 10 mares in the lot, 7 of them of breeding age; of the 7, 6 promise to be excellent brood mares and have been bred to General Gates. The young stock were, with one exception, by the Morgan stallion Troubadour, which attracted so much attention at the live-stock show of the Alaska-Yukon-Pacific Exposition in 1909. One of the 5 young stallions has been castrated. Five of the mares were bred in Vermont, and are good representatives of the old-fashioned Morgan lines, which have proved so valuable in mating with General Gates. The mare Maggie Gates was bought in October, 1910.

The board of survey condemned 4 horses in 1910, which were sold at auction, and 3 condemned weanlings were sold by the Vermont Experiment Station.

The 5-year-old stallion Red Oak has been leased to the Massachusetts Agricultural College, and, although sent to Amherst somewhat late in the season, has received about 20 mares of very good quality. The conditions under which the stallion was leased are of

considerable importance, and should be included in this report. The college received the horse f. o. b. Middlebury, Vt., and agreed to keep him in good condition and give him a stipulated amount of exercise daily. The service fees go to the college, but the service fee can not exceed \$15. Mares bred must be free from draft blood, free from pacing gait, without manifest defects of conformation such as curby hocks, and free from the following unsoundnesses: Bone spavin, ringbone, sidebone, heaves, stringhalt, lameness of any kind, roaring, periodic ophthalmia, and blindness, partial or complete. It is interesting to note that the college has disqualified almost as many mares as have been bred.

The following statement shows the number of horses on the Morgan Horse Farm on June 30, 1911:

Ages.	Stallions.	Mares.	Geldings.	Total.
Aged.....	12	222	84	28
4-year-olds.....		3	1	4
3-year-olds.....	1	1		2
2-year-olds.....	2	7	1	10
Yearlings.....	7	4		11
Weanlings.....	5	5		10
Total.....	17	42	6	65

¹ One stallion leased to Massachusetts Agricultural College.

² One mare vet to foal.

³ Work horses.

ARMY HORSE BREEDING.

Although the desired appropriation for the encouragement of the breeding of horses for the United States Army was not provided by Congress, a small beginning has been made and the plan presented in my last report is being tested experimentally, as described in an earlier part of this report.

SHEEP AND GOAT INVESTIGATIONS.

The work in Wyoming in breeding range sheep has progressed very satisfactorily during the past year. The ewes gave an 80 per cent crop of good lambs last spring, and those ewes to be carried into the ensuing year sheared 13.1 pounds per head. They stand the range nicely. The 110 yearling ewes which will go into the breeding flock next year are very growthy and strong, and give promise of approaching closely the type sought.

The Southdown flock at the Morgan Horse Farm, Middlebury, Vt., has been maintained at a high standard, and accurate records are being kept of cost of keep and of production. The spring lamb crop was satisfactory.

At the experiment farm at Beltsville, Md., sufficient Barbados ewes have been bred pure to maintain the flock, and the rest have been bred to a Karakul ram, to determine the possibility of producing Afghan skins in the United States.

The Merino-Barbados-Southdown crosses breed at any time of the year, and each cross shows improvement in wool and mutton form.

The native goats were milked after the last kidding and gave fair results.

A few samples of wool have been collected and arranged for display and study.

CATTLE BREEDING.

HOLSTEIN CATTLE.

The work of the Holstein breeding circuit in North Dakota in cooperation with the State experiment station has been conducted along the same lines as heretofore. All the cattle in the circuit were tested with tuberculin during the year, and several herds showed reactions. The reacting cattle are to be disposed of.

A year's record of all cows in the herds was completed January 1, and the approximate cost of production of butter fat determined. Some of the purebred cows produced over 500 pounds of butter during the year. Several heifers have been placed in the Advanced Registry during the year, and all of the more promising cows and heifers will be tested for advanced registry next year.

Seven members of the circuit have built silos during the year, none of whom possessed them before becoming members of the circuit.

The number of purebred Holsteins owned by members of the circuit is 107.

MILKING SHORTHORNS.

Four herds have been included in the investigations in breeding milking Shorthorn cattle during the past year in cooperation with the Minnesota Experiment Station, and the experiment station bulls were used somewhat during the year in three other herds. The general progress made in the work for the year has consisted mostly in the improvement made by the cooperators in the care and management of the herds. This has resulted in growing the young animals better, and in much improvement in the milk and butter-fat production of the cows on the circuit.

The two sires, Chief of Glenside No. 285899 and Beau of Glenside No. 285898, have been continued in the service. The calves produced by them are developing satisfactorily from the standpoint of conformation. Since no daughters by these sires have come into milk as yet, no knowledge of their ability to transmit their milking inheritance is at hand.

In addition to these two sires, several of their sons, out of approved dams, have been farmed out to prospective cooperators who should be taken into the circuit as soon as they have a sufficient number of females of producing age.

The experiment station and one of the cooperators have purchased jointly the bull Clay Johnson No. 330890, a 3-year-old sire combining meat conformation, Shorthorn character, and milking heredity to a rare degree. This sire has no daughter in milk as yet, but his get are showing up well individually.

All heifers produced by approved dams are being reared. The bulls produced have been disposed of as follows: Those not showing sufficient individual merit, and those out of low-producing dams, have been rejected and castrated. Those from profitable milking dams that developed well individually have been sold to breeders in the usual way. A few from high-producing dams of satisfactory conformation have been reserved to the circuit and used somewhat on other herds.

ANIMAL BREEDING INVESTIGATIONS.

The research work in animal breeding at the experiment station of the bureau near Bethesda, Md., has continued during the year, the most extensive and important investigation being the study of inbreeding in guinea pigs. Twenty-four families are being inbred, matings being made between litter brother and sister in each generation. All families have been thus inbred for 4 generations and some for 10 generations. The data accumulated for the 4 generations are being compiled for a preliminary report.

The vitality of guinea pigs that have been inbred for seven generations is being determined by inoculating them with tubercle bacilli. Guinea pigs of equal weight and age, but not inbred, are used as checks. The principals and checks are born and reared in the same building and cared for and treated in exactly the same manner. From results so far obtained it appears that there is no difference in the vitality of the inbred and the normal animals. Before definite conclusions are reached in this matter, however, the experiments must be repeated and large numbers of animals used.

This intense inbreeding is developing in a number of families certain family characteristics which are shown in the color markings, in size of individuals, and in length and texture of the hair. Breeding for the establishing of certain coat-color patterns in guinea pigs has been continued with negative results, as has also an experiment started with the idea of increasing the length of ear in guinea pigs by selection.

Owing to an outbreak of rabies among the white bull terrier dogs they were all destroyed and the work on telegony in which they were used has been discontinued.

POULTRY INVESTIGATIONS.

MAINE WORK.

By the plan of selection now being practiced it has been possible to isolate from the flock strains or "blood lines" which are breeding true to definite standards of egg production. There are now being propagated (1) lines having a high winter egg production, (2) lines having a medium degree of winter productiveness, and (3) lines of low winter production. The results of this work are of a definite and clear-cut character.

By the application of Mendelian principles in the work with hybrid poultry it has been possible to combine in one strain the good meat qualities of the Cornish Indian game with the good egg qualities of the Barred Plymouth Rocks, thereby creating a new type regarded as very desirable from the utility standpoint.

INDEPENDENT INVESTIGATIONS.

During the year the poultry work has been removed from Bethesda, Md., where it was formerly carried on, to the bureau farm at Beltsville, Md. It was deemed inadvisable to move any of the old stock, and this was in consequence marketed. To replace this stock, eggs were purchased from representative flocks of the following breeds: Barred Plymouth Rock, White Wyandotte, Single-combed Rhode Island

Red, Buff Orpington, and Single-comb White Leghorn. Chicks hatched from these eggs are now being raised and will form the foundation stock for the new farm. As a result of the moving and the disposal of the mature stock, no feeding or breeding experiments were carried on during the year.

The investigation of conditions surrounding the handling and marketing of eggs in the Middle West has been continued, mainly in the State of Kansas, and has been very successful. This investigation embraces the study of conditions from the farm to the packing house, experimental work to determine the causes of loss and deterioration, and the encouragement of the use of the "loss-off" system of buying eggs. As a result of the efforts of the bureau in Kansas in cooperation with the State authorities, neighboring States are becoming interested in the movement for better eggs.

A careful study has been made of the commercial feeding or fattening of poultry, particularly milk fattening, in this same area. Detailed figures of the gain, cost of gain, amount of grain per pound gain, etc., have been obtained for over 30,000 birds. The figures, therefore, are believed to be very reliable.

Some attention has been given to the encouragement of marketing eggs through the creameries. Several creameries are now handling the eggs produced on the farms of their patrons, with good success. Other creameries have indicated their intention of starting such a system of handling eggs in the near future.

ANIMAL NUTRITION INVESTIGATIONS.

During the fiscal year the work in animal nutrition in cooperation with the Pennsylvania State College has consisted largely in a thorough revision and testing of the respiration calorimeter, together with the addition of certain improvements designed to secure more detailed and accurate results. These improvements include appliances for the determination of the excretion of carbon dioxide and water in the standing and lying positions, respectively, an additional electrical furnace for the determination of methane, and repairs to the refrigerating machine. Additional laboratory equipment has also been procured, which will conduce to the rapidity and economy of the work.

During the fiscal year 1911-12 it is planned to make a comparative study of the effects of standing and lying upon heat production and upon the excretion of carbon dioxide, and also to continue the determinations of the energy values of feeding stuffs.

BEEF PRODUCTION INVESTIGATIONS.

The beef production investigations carried on through the Alabama Experiment Station with two large landowners in Sumter County, Ala., are progressing in a highly satisfactory manner. Every phase of the cattle industry under those conditions is being studied, and results are being obtained which, it is believed, will be of great value to the South. The fact that cattle can be fed profitably in Alabama in summer has been demonstrated by the officers in charge of this work. It is fortunate that the work is so well advanced that by the time the pastures of western Alabama are free from ticks and the cotton boll

weevil reaches that section data of a comprehensive and accurate nature will be available to show those farmers desiring to embark in the cattle business how it should be conducted to be profitable.

PORK PRODUCTION INVESTIGATIONS.

The pork production investigations, conducted under similar conditions in Sumter County, Ala., are also yielding encouraging results. The farm on which the work is done is now on a profitable basis, and it is believed that it will become more profitable as time goes on.

CERTIFICATION OF PURITY OF BREEDING OF IMPORTED ANIMALS.

Since January 1, 1911, the department has exercised the power given to it under the provisions of paragraph 492 of the tariff act of August 5, 1909, to pass upon the sufficiency of the pedigree certificates of animals imported for breeding purposes, instead of delegating this function to certified American pedigree record associations, as has been the policy heretofore.

From January 1, 1911, to June 30, 1911, inclusive, there were imported 1,171 horses, 1,427 cattle, 12 sheep, 7 hogs, 190 dogs, and 12 cats, for which certificates of pure breeding have been issued by this bureau.

In connection with the examination of certificates the animals are inspected at the port of entry to see that the animals and certificates agree in description. During the first six months of the calendar year 33 certificates for horses have been returned to the importers on account of the animals not agreeing with the certificates. There have also been returned to the secretaries of the foreign breeders' societies for correction 23 certificates for horses, 20 for cattle, 2 for sheep, and 2 for dogs. Pamphlets are issued quarterly or at other intervals giving the names and registry numbers of the imported animals, names of importers, and the dates of importation.

THE EXPERIMENT FARM.

The work at the experiment farm of the bureau near Beltsville, Md., has been devoted almost entirely to putting the farm into condition for experimental work. A dog-tight 58-inch woven wire fence is being built around the farm, fields and paddocks are being fenced, and a road and lanes constructed. A tool and implement shed has been built, and the superintendent's dwelling repaired and the interior painted and papered. A hog house, a poultry house, and a building for the research work in animal breeding are being erected, and numerous small portable houses built. The land has been cleared and plowed. Thirty-five acres are in corn and 100 acres in cowpeas. All tillable land is being broken up and put into some kind of crop.

The equine stock, the sheep, and the goats have been transferred from the Bethesda Experiment Station, and the guinea pigs and other small experimental animals will be moved as soon as quarters are available. Two pure-bred Percheron mares, 2 years old, were purchased in June, and a small herd of grade Berkshire pigs has been started.

PLANS FOR 1912.

Among the plans for 1912, worthy of note in this place, may be mentioned the following:

(1) It is proposed to begin preparations to make an exhibit of the horses bred at the Colorado Experiment Station, and the Morgan horse farm, at the larger live-stock shows of 1912.

(2) In order to encourage farmers of Vermont, especially those near the Morgan horse farm, to breed to the stallions kept there, it is proposed to stand the stallions during the season of 1912 without charge for service fees, the owner of a mare to agree in return to give to the United States at an agreed price an option on the resulting foal during the year it is 3 years old. Mares must be registered in the Morgan Register, free from pacing gait, of good conformation, and sound. In this way the breeding of high-class horses in the State can be encouraged, information as to promising fillies can be obtained, and any branch of the Government, including the Army, may avail itself of the option.

(3) A collection of samples of wool will be begun during the year, designed to show the characteristics of the classifications at various markets, and a study of the relation between quality in fleece and in the finished cloth will also be undertaken if suitable arrangements can be made.

Some ewes of the long-wool breeds, with fleeces of high luster and free from excessive grease, will be purchased to breed to the Karakul buck, for the study of the possibility of growing "Persian lamb" in the United States.

An exhibition of sheep bred by the Department in the Wyoming project will be made at two live-stock shows of 1911.

Other projects will be carried on practically as during the past year, with due allowances for natural growth.

THE DAIRY DIVISION.

The work of the bureau relating to the dairy industry comes under the Dairy Division, of which Mr. B. H. Rawl is chief.

DAIRY FARMING INVESTIGATIONS.

The principal lines of dairy farming investigations, in charge of Mr. Helmer Rabild, are southern dairying, western dairying, cow-testing associations, and experimental work.

SOUTHERN DAIRYING.

The educational work for the development of dairying in the Southern States is progressing along the same lines as in previous years and includes herd improvement, economical feeding, the building of barns, silos, dairy houses, and ice houses, the creation of interest in dairy organizations, the improvement of city milk supplies, the conduct of short courses in dairying, operating model dairies and making dairy exhibits at fairs, the supervision of butter contests at fairs, work with creamery patrons, etc. The work is in progress in Alabama, Tennessee, Georgia, Mississippi, North Carolina, South Carolina, Texas, Virginia, Maryland, and the District of Columbia. The work in

Maryland was begun May 1, 1911. It is the policy of the department to work in cooperation with State authorities or institutions and to turn the work over to these agencies when they are prepared to carry it on alone. During the past year the assistance previously given in North Carolina was withdrawn because the work there no longer needed help from the department. The work in Tennessee has been temporarily suspended until State cooperation can be arranged for.

For the past few years the Dairy Division has managed a demonstration dairy farm near Denison, Tex., owned by the Denison Board of Trade. That the improvement of the herd on this farm has been very marked is indicated by the fact that the average production of butter fat per cow has been increased 55 pounds during the past year. Although the work of the farm has been hampered by drought during the past two years, it is still hoped it will yet serve fully the object for which it is being conducted, namely, to demonstrate a successful and profitable dairy farm in that section.

Frequently promoters attempt to build and sell creameries in various parts of the Southern States, the people of the community being induced to furnish the capital. The Dairy Division advises against this in localities where conditions appear to be such as to make it impossible for a creamery to be operated successfully. Of seven creameries promoted in Georgia two years ago against the division's advice six have been closed and the other is being operated at a loss. It is very important that creameries should not be built under unfavorable conditions, since the failure of a creamery gives the dairy industry a great setback in the adjacent community.

WESTERN DAIRYING.

The work for the development of dairying in the Western States is conducted along the same general lines as that in the South. It is at present carried on in Colorado, Idaho, North Dakota, and Iowa. The results indicate that the West offers a most favorable field for this work, which it is believed will be the means of starting work in the various States which in time will become an important factor in developing the dairy industry in that section. Splendid opportunities for dairying are found in Idaho, where during the past year alfalfa sold as low as \$1.25 a ton, the average being \$3. An opportunity is offered there to give the farmers assistance in securing cattle to consume this alfalfa at a much better profit. Opportunities quite similar have been found in Colorado and other Western States, where in the past the farmers have devoted their attention largely to range cattle, and therefore often know practically nothing of scientific dairying. The reduced ranges and the increased prices of land are factors that make dairying a very much more important part of the agriculture of that section than it has been in the past. The great number of mistakes commonly committed indicate the lack of knowledge of economical dairy practice. By demonstrating such practice on a few of the dairy farms, sufficient public sentiment is being created to enable the States to secure funds to take up this work. In fact, some assistance is already being given by all the States in which extension work by the department is now in progress. The department's work in the West can be extended to excellent advantage if more funds are provided for it. At least one man should be assigned to each of the States west of Kansas and Nebraska and also in the Dakotas.

COW-TESTING ASSOCIATIONS.

Two men have been engaged in giving assistance to State officials in organizing and conducting cow-testing associations. This work has been described in previous reports. During the past fiscal year 33 new associations were formed and 7 were discontinued. At present there are 81 associations in the United States, the greater number of which the Dairy Division has been instrumental in organizing. The plan in organizing is to require local officers to assume responsibility for conducting the organization. When necessary, assistance is given in maintaining these associations by sending a man to straighten out difficulties that arise. These 81 associations comprise about 40,000 cows. The following results in two herds of one of the associations are an interesting example of what is being accomplished in enabling farmers to keep records of cost, production, etc., and to detect and remedy any shortcomings:

Comparison of averages of two herds in same association.

Herd.	Milk.	Fat.	Value of fat.	Roughage.	Grain.	Cost of feed.	Net profit.	Cost of 1 pound butter fat.
	<i>Pounds.</i>	<i>Pounds.</i>		<i>Pounds.</i>	<i>Pounds.</i>			
1.....	9,207.6	392.7	\$127.26	8,913	1,914	\$51.04	\$76.22	\$0.129
2.....	5,482.1	198.9	63.86	5,555	1,963	55.21	8.65	.277

One of these herds made a profit of \$76.22 per cow, while the other made a profit of only \$8.65 per cow. The more profitable herd was fed an abundance of silage, while to the other no silage was fed. This, of course, is not the only reason for the difference; however, a careful study of the records of these herds indicates that silage is very essential to the maintenance of a full milk flow during the winter months. The owner of the unprofitable herd has been living next to a man who had a silo for a number of years, yet he did not realize its usefulness until he saw these figures, after which he built a silo at once.

Plans have been prepared for the organization of several bull associations for the purpose of enabling the owners of several small herds to cooperate in securing better bulls.

HERD RECORDS.

The practice of keeping records of single herds separately is urged only where cow-testing associations can not be organized. Herds containing 1,174 cows have been included in this work during the past year. From one herd, as a result of this work, 25 unprofitable cows were sold. In another herd, by change of feed, the cost of feeding per cow was reduced from \$6.52 to \$5.48 per month. In still another the cost of feed was reduced from \$6.05 to \$4.63 by the same means. The use of pure bred bulls follows as a natural result of any kind of herd-record work.

DAIRY BUILDINGS.

Blue prints have been furnished to farmers during the year for 236 barns, 113 silos, 124 milk houses, 45 ice houses, 8 dairy schools, 5 man-

ure sheds, and 105 miscellaneous structures. This work has been received with much appreciation by the farmers, and the bureau has been obliged to refuse many requests for plans to suit specific requirements, also for plans for peculiar conditions in the West, owing to the pressure of work.

Assistance has been given during the year in the erection of 140 silos, 36 of which were of concrete reenforced with wire fencing, 1 was of metal lath and cement, 2 were of brick, and the rest of wood, either stave or modified Wisconsin type. This work of encouraging the use of silos is very fruitful. The advantage of using silage is well recognized; still the average dairyman is inclined to regard the silo as an experimental venture until he has seen one used successfully. Therefore, whenever one silo is built in a community where there are none, others are usually built later.

EXPERIMENTAL WORK.

During the spring an experiment was made, in cooperation with the Bureau of Plant Industry, in feeding to a herd of dairy cattle at Wiley, Va., an extract made from cornstalks in the process of paper manufacture, for the purpose of determining the value of this extract as a feed. It was not possible to make the experiment comprehensive and complete, but it was intended as a preliminary investigation to determine in a general way whether or not some value could be assigned to this by-product as feed for dairy cattle. The substance showed no deleterious effect on the cattle, and in a general way appeared to have a value of not less than \$9 a ton as compared with other feeds at current prices. More comprehensive investigation may indicate a greater value.

MARKET MILK INVESTIGATIONS.

The work of market milk investigations, of which Mr. George M. Whitaker is in charge, is largely educational in character with a view to improving local milk conditions, and is carried on mainly in cooperation with city health departments. During the year this work has included 51 cities in 27 States. This number does not include suburban places adjoining large cities in which a considerable work has been done. The chief lines of work have been introducing and carrying out the score-card system of inspection, assisting in competitive exhibitions of milk and cream, inspecting the milk supply placed on sale in the Government departments, and investigating the conditions of the milk business in the vicinity of Boston.

In the introduction of the score-card system and the giving of assistance in properly carrying it out, 620 inspections were made in 24 States. These inspections were made in company with either the health officer or one of his inspectors.

A number of States and municipalities that have had inadequate laws have, partly because of the department's work, enacted laws to provide suitably for milk inspection.

The importance of work such as is being done by the department in assisting city health authorities to improve the milk supply is shown by the fact that a large proportion of the deaths of young children in cities is undoubtedly due to bad milk. Great improvement has been brought about in some cities, but in many cases there are serious obstacles to progress, such as political conditions and the ignorance of

milk consumers. One of the most important things in milk inspection is the employment by the cities of properly qualified inspectors who are capable of educating the farmers and the public.

The bureau assisted in nine competitive milk exhibitions during the year. These contests serve a useful purpose in educating the consumers as well as the producers of milk.

During the past year a system of inspection and permits for milk sold in the Department of Agriculture was established. When this became known, the Departments of Commerce and Labor, Interior, Treasury, State, War, and Navy requested the assistance of this department in introducing and carrying on similar inspection in those departments. The Dairy Division is conducting this inspection, in cooperation with the chief clerks of the respective departments. Only seven dealers are now permitted to sell milk in these departments. Eleven others that have at one time or another had permits have been refused a continuation of these permits because of the inferior quality of their product. It is believed that this inspection is serving a useful purpose, not only in protecting the employees, but in establishing a precedent that may be helpful to the general milk inspection of this and other cities.

A special investigation of the milk business in Boston and vicinity was begun late in the fiscal year, in cooperation with the health officials of that city, and is still under way.

DAIRY MANUFACTURING INVESTIGATIONS.

The work relating to dairy manufactures, in charge of Mr. S. C. Thompson, includes the inspection of butter, assistance in the management of creameries and other dairy manufacturing enterprises, and the study of processes and products from the commercial standpoint.

MARKET INSPECTION OF BUTTER.

The market inspection of butter has been continued, 2,723 inspections having been made at Chicago, 2,505 at New York, and 126 at San Francisco, a total of 5,354. This is an increase of about 75 per cent over the previous year, which indicates that the work is regarded with increasing favor by the trade. This inspection is made at the request of the dealer or the producer, and defects in the butter are pointed out and suggestions made for remedying them.

CREAMERY MANAGEMENT.

Field men located in Wisconsin, Minnesota, Iowa, California, and Texas have given assistance to creameries with a view to improving their efficiency. One thousand three hundred creameries have made reports to the Dairy Division, showing amount of butter fat received, amount of butter made, prices received for butter, and prices paid to the farmers for butter fat. In this way a large number of defects in creamery operation are detected and corrected, either by correspondence or by personal attention of the field men. During the year 74 creameries received personal attention from the field men.

A large quantity of low-grade butter is still being produced, as is indicated by the reports of market inspectors. Of 2,161 shipments of butter from Minnesota, Wisconsin, and Iowa, only 277, or about

12.8 per cent, graded "extras." This indicates that there is much need of improvement in quality of cream used by the creameries and also in the workmanship in the creameries.

All encouragement possible has been given to the practice of grading cream, so that a first-class cream may be separated from the inferior cream and paid for according to quality. Twenty-eight creameries, located in 9 different States, report that they are grading their cream with good results. An experiment, begun early in the winter of 1910, is being conducted at the Algona, Iowa, creamery for the purpose of determining whether or not the farmers can be induced to supply a high grade of cream that will sell for an extra price. The cream is being graded, the first grade containing less than 0.2 per cent of lactic acid, and the second grade containing more than this proportion. At first the bulk of the cream went into the second grade. At present more than two-thirds of it is first grade and is sold for a premium of about 5 cents per pound of butter. This work is being conducted in cooperation with the State dairy commissioner of Iowa and with the professor of dairying at the Iowa State College of Agriculture. The main object sought is to ascertain whether or not it would be profitable for creameries to conduct similar educational work at their own expense. So far the results of this work have been satisfactory, and it is proposed to continue it.

The work of assisting in the organization of new creameries by furnishing articles of agreement, by-laws, lists of machinery, etc., has been continued. Care is exercised to give this assistance only in localities where creameries are justified by conditions.

Creameries are encouraged to pay more attention to what may be called "side lines" for the utilization of their by-products, and 453 creameries are known to follow such a practice. Some of the most important of these "side lines" are feeding buttermilk to hogs, making ice cream, manufacturing ice, shipping sweet cream, and handling eggs.

HARVESTING AND STORING ICE.

A very large proportion of the dairymen of the United States can have natural ice at a very small cost if they can be taught the necessity of it. In the main the bad cream received at the creameries is due to dirt and heat, and the bad milk in cities is largely due to the same causes. The Dairy Division is therefore doing what it can to encourage the storage and use of natural ice. An investigation has been made in the New England States relative to the most practicable methods of harvesting and storing ice for dairy use, and information on this subject is being prepared for publication.

INSPECTION OF BUTTER FOR THE NAVY.

The Dairy Division has continued its inspection of butter for the Navy. Between April 5 and August 15, 1910, 702,000 pounds of butter was thus inspected, and similar inspection was carried out in 1911. When this inspection was begun the quality of the butter which was being received was invariably below the grade called for in the contract. The inspectors have consistently rejected all such butter, and in this way a considerable sum has been saved to the Government. In New York, for example, 238,000 pounds of butter was examined, of which 82,000 pounds was rejected.

RENOVATED BUTTER INSPECTION.

The inspection of renovated or "process" butter and of the factories where it is produced is carried on under the act of Congress of May 9, 1902, and is under the direction of Mr. Robert McAdam. The Dairy Division is assisted in this work by some of the members of the meat-inspection force of the Inspection Division. The bureau cooperates with the revenue officers of the Treasury Department, especially by making moisture tests and notifying those officials when butter is found containing moisture in excess of the legal limit of 16 per cent.

There are 38 bonded factories producing renovated butter, a few of which operate very irregularly. The total amount of renovated butter produced during the fiscal year was 41,115,058 pounds, a decrease of 5,799,436 pounds as compared with 1910. The exports amounted to 118,990 pounds, an increase of 87,140 pounds.

The present law is not entirely satisfactory and does not give sufficient authority for proper inspection. A recommendation for the amendment of this law has been made, and it is hoped that the needed authority may be granted. Many of the manufacturers are endeavoring to make as good a quality of butter as possible, and with their cooperation it has been possible to bring about improvements in the sanitary condition of factories, even though there was doubt as to the department's power to enforce such measures. Under the present law the use of the word "renovated" has been almost entirely abandoned by the manufacturers, and the term "process butter" is used almost exclusively, thus giving rise to much deception.

RESEARCH LABORATORIES.

The dairy research laboratories, in charge of Mr. L. A. Rogers, have been engaged upon various chemical and bacteriological problems in connection with milk, butter, and cheese. The work on milk and butter is carried on at the central laboratory at Washington and the field laboratory at Troy, Pa. The chemical and bacteriological work on the Swiss type of cheese is carried on at Washington, and the cheese making is done at the Pennsylvania State College in cooperation with that institution. The Cheddar cheese work is conducted at Madison, Wis., in cooperation with the Agricultural Experiment Station of the University of Wisconsin; and the Roquefort cheese work at Storrs, Conn., in cooperation with the Storrs Agricultural Experiment Station. The investigations on milk secretion are carried on at Columbia, Mo., in cooperation with the Experiment Station of the University of Missouri.

At the close of the butter-making season of 1910 conditions had become such that it was necessary to suspend the work at Albert Lea, Minn., where a field laboratory of the Dairy Division had been operated in connection with the creamery of the Albert Lea Dairy Association. Arrangements of a tentative nature were made with the Pennsylvania State College for the Swiss cheese work. The field laboratory and experimental butter-making work have been established at Troy, Pa., through a contract with the Troy Creamery Co. This arrangement provides the bureau with laboratory space in a new creamery of modern design and construction. Under the contract the bureau has entire control of the operation of the creamery, without

responsibility for the financial side of the business beyond the cost of manufacture. This will make it possible to carry on investigations in the management and operation of a large creamery, in addition to the more technical work in butter making. The Troy creamery is easily accessible from Washington, thus increasing the efficiency of the field laboratory without adding to the expense of operation.

MILK INVESTIGATIONS.

The milk investigations have included a continuation of the work of the previous year in studying the bacteria of pasteurized and raw milk. The results of this study were published as Bulletin 126 of the bureau. One of the most interesting facts brought out by this work is that pasteurized milk ordinarily does not decompose, as it is generally supposed to do, but sours in a normal way. While this work was not sufficiently extensive to warrant final conclusions, it indicates very strongly that pasteurized milk often contains a higher percentage of lactic-acid-forming bacteria in comparison with other forms of bacteria than raw milk does. In this connection 300 cultures were examined for fermentative ability, and a new medium has been developed which promises to be of much value in milk work. This study has also included the bacteria which produce alkalinity in milk.

The subjects of buttermilk and whey as by-products are under investigation, and the production of an excellent massage cream by means of separating the curds from buttermilk has resulted. It has been found that an active culture of *Bacillus bulgaricus* is capable of converting nearly all the milk sugar in whey into lactic acid. This is particularly interesting since about 10,000,000 pounds of lactic acid, valued at \$158,000, was made from glucose in this country in 1905.

Chemical work in connection with this investigation has supplied some exact information on the subject of chemical changes in milk due to pasteurization. This study has developed some interesting results pertaining to the proteids most likely to be coagulated by heat. Milk heated for 30 minutes to 145° F. showed no change. At 150° F., 5 per cent of the albumin and globulin were precipitated. At 155° F. 12 per cent of these were precipitated, and at 160° F. 30 per cent. Similar results have been obtained relative to changes in the ash, and in determining the time required for coagulation with rennet. In the latter case milk heated to 150° F. for 30 minutes showed no change in the time required for coagulation, but when heated to 176° F. for 30 minutes the time of coagulation was increased threefold. Milk pasteurized at 145° F. is therefore free from the objection sometimes urged against pasteurization because of the alleged precipitation of albumen. This objection applies only when the milk is heated to an unnecessarily high temperature.

About 150 samples of goat's milk have been analyzed for moisture, fats, and solids, opportunity being afforded to make these analyses on milk furnished by the Animal Husbandry Division.

The investigation relating to lactic-acid bacteria is complete and the results are being prepared for publication. This investigation has established the possibility of separating this group into distinct and well-defined subordinate groups. An investigation of the gas-forming bacteria in milk is under way.

In the milk-secretion investigations carried on at Columbia, Mo., in cooperation with the Experiment Station of the University of Missouri, the principal lines of work for the past year have been:

(1) The influence of the plane of nutrition on the composition and properties of milk. The plan followed was to keep certain cows on maintenance rations for a period, then to feed them on a ration that supplied less nutriment than the amount necessary to maintain the body and support the milk production. The animals were then gradually brought back to the maintenance ration, and finally fed an excessive amount of feed, causing a deposition of fat on the body. These variations in the plane of nutrition were tried several times on the same animals. The experimental part of this investigation is completed, but the data have not been prepared for publication. The results secured are believed to be of considerable importance and bring to light new factors that will have to be taken into account in the future as causes of variation in the composition of milk.

(2) The effect of cotton seed, cottonseed meal, and cottonseed hulls on the composition and properties of milk. Three phases of the problem have received special consideration, namely, (a) the effect of the amount fed; (b) the effect of the kind of supplementary feeds used with the cottonseed meal; (c) the effect of adding lime to the ration. Considerable data have been obtained, but the investigation has not been completed.

(3) A study of the coloring matter of butter. Further work has been done on the isolation and identification of the lipochrome, or natural coloring matter of butter, but the work is not yet completed.

(4) The preservation of milk samples for analysis. A thorough study of the efficiency of certain chemicals as milk preservatives, and the best conditions, such as the temperature and the container, etc., for preserving milk, has been in progress all the year. This work is nearly completed.

The investigations that are still incomplete will receive first consideration, and will be finished during the coming year, if possible. It is also planned to study the effect of cotton seed, cottonseed meal, and cottonseed hulls on the market value of butter.

CHEESE INVESTIGATIONS.

SWISS CHEESE.—The work on the Swiss type of cheese has been considerably handicapped by the moving of the laboratory from Albert Lea, Minn. It has been found, however, that cheese without gas holes other than the usual "eyes" can be made from very gassy milk by the use of the so-called *Bacillus bulgaricus* starter of exceptional activity, ordinary cultures of this organism failing to produce the same results. A study of the bacterial flora of imported and domestic Swiss cheese showed that after the initial period the bacteria consisted almost exclusively of two varieties of the *B. bulgaricus* type. This fact has an important bearing on these investigations.

The chemical work in connection with Swiss cheese has established the fact that the first proteolytic change in ripening Swiss cheese is the formation of substances soluble in salt solution. A method for collecting the gases from the eyes of Swiss cheese has been worked out, and the apparatus for this determination constructed. The study of pasteurization of milk for Swiss cheese making is being continued.

CHEDDAR CHEESE.—The work relating to the Cheddar type of cheese has continued about as in the past. The use of hydrochloric acid in

the manufacture of Cheddar cheese from pasteurized milk has been continued. The following points in this connection are being investigated:

(1) The practicability of this method in the hands of experienced cheese makers.

(2) The possibility of applying the method daily throughout the year to all sorts of milk which may lawfully be used for cheese making in Wisconsin.

(3) The precautions to be taken in the use of this method.

(4) Whether the curing of pasteurized milk cheese can be safely conducted at a higher temperature than that of raw milk cheese.

(5) The suitability of this cheese for various markets.

(6) The loss in weight during shipment and sale of cheese in the South.

(7) The relative quality of raw milk cheese and pasteurized milk cheese made from the same milk supply.

(8) The cost of pasteurization and the cost of manufacture when pasteurized milk is used, as compared with the same costs when raw milk is used.

It is hoped to establish standard methods of cheese making whereby the milk can be brought into uniform condition from day to day, and thus to make it possible to manufacture a uniform article.

The bacteriological work in connection with this line of investigation has been a continuation of the study of the forms of bacteria important in the manufacture of Cheddar cheese. Specific cultures have been isolated from cheese made of raw and of pasteurized milk, and these cultures have been studied, considerable attention being given to the high-acid-producing bacteria found in cheese. Chemical work to a considerable extent has been devoted to the nonnitrogenous constituents of good and poor cheese at different stages in ripening.

SOFT CHEESE.—The work on the Roquefort variety of cheese has comprised the investigation of (1) the chemical composition of Roquefort cheese and the establishment of a standard for this variety as compared with other varieties; (2) the chemical changes taking place in the process of ripening; (3) the effect of salt on the ripening process; (4) the method of handling the Roquefort mold powder used in inoculating the cheese; (5) the effect of lactic-acid starters in manufacturing this variety; (6) the water content and its relation to the proper ripening of the cheese.

Chemical work in connection with these investigations was devoted to an investigation of the water content at various stages of ripening, the means of controlling it, the relation of acid in the milk to the quality of the cheese, and methods of salting and handling the cheese during the process of ripening.

There are various minor problems under investigation in connection with the work on soft cheese. These investigations develop results rather slowly, because there has been so little experimental work done along this line and because there are so many questions that demand study. This work is being conducted in a thorough and comprehensive manner, and this requires much time and work. However, one by one the questions involved are becoming understood, and it is hoped that in time this work will supply knowledge that will serve as a basis upon which a profitable soft-cheese industry may be established in America.

BUTTER INVESTIGATIONS.

The work pertaining to changes in storage butter has been continued with some progress. The effect of metallic salts on cream has been studied, with the result that 20 parts of a metal salt in a million parts of cream show a distinct influence on the flavor of the butter, copper being more active than iron. These investigations have already shown that deleterious effects were obtained when acid cream was used. More recently it has been found that when oxygen is run through a flask of milk containing metal salts a strong odor is produced in a short time. All these facts support the hypothesis that the principal changes in storage butter are due to the catalytic action of metal salts produced by the action of acid cream on cans, vats, and other containers in inducing an oxidation of some constituent of the butter. This hypothesis can not be definitely established as yet, but recent results are very encouraging. A method has been perfected for measuring the gases in butter, and by this means it is hoped that oxidation can be measured.

An effort has been made to establish a method of determining lime in butter when used as a neutralizing agent.

For the purpose of establishing the normal composition of creamery butter, upon which more satisfactory standards may be based, about 1,000 samples of butter have been analyzed during the year.

During the past season butter made from unpasteurized ripened cream (the usual method), from pasteurized ripened cream, and from pasteurized sweet cream was stored and compared, and the results again showed the superior keeping qualities of that made from pasteurized sweet cream. This butter was free from fishy or other storage flavor. The results are summarized in the following table:

Comparison of storage butter made by different methods.

Method.	Initial score (average).	Storage tempera- ture.	Score after storage (average).
Raw cream, ripened.....	92.4	"F. 0 10 20	87.3 86.9 86.3
Pasteurized cream, ripened.....	93.4	0 10 20	91.2 90.3 88.3
Pasteurized cream, sweet.....	92.9	0 10 20	92.4 91.9 91.4

In studying the relative cost of making butter from pasteurized and unpasteurized cream the results indicate that no more coal is used in making it from the pasteurized than from the raw cream, and the difference in ice is comparatively small.

The investigations looking to the production of dried cultures for use in butter and cheese making have been handicapped by the fact that a patented process is involved; but aside from this process it has been found possible to produce dried cultures containing 50,000,000 cells per gram, and this is a very great improvement over the cultures usually found on the market. This work will be continued and will

be extended to include a study of the loss of vitality in cultures after drying.

DAIRY ENGINEERING.

Work on various engineering problems pertaining to the dairy industry has been continued. Particular attention has been given to dairy buildings, equipment, machinery, etc. During the past year the services of an expert engineer have been obtained to conduct investigations pertaining to cold storage. There is little scientific information on the general subject of cold storage, and practically none that applies especially to dairy problems. In many phases of the dairy business cold storage is a tremendous factor, and the most economical methods of applying it are of great importance. It is hoped that this work will develop some improved methods in the shipping of milk.

THE BELTSVILLE FARM.

The portion of the bureau's experiment farm at Beltsville, Md., set aside for the Dairy Division, amounting to 185.7 acres, is now under cultivation. The principal work done on the farm so far has been in connection with putting the fields into condition for cultivation. Most of the land has been freed from stumps, the ditches have been straightened, and the place is being rapidly brought into a good state of cultivation. Two concrete silos have been built and a feed barn, of monolithic concrete, has been begun. One wing of the barn will be built as an open cattle shed and the other will be the ordinary type of cow stable, thus giving an opportunity to compare the two systems of housing dairy cattle. It is proposed to buy a small herd of dairy cattle for experimental purposes.

THE INSPECTION DIVISION.

The work of the Inspection Division, in charge of Dr. R. P. Steddom, chief, consists of the meat inspection and the control and eradication of contagious diseases of animals.

THE MEAT INSPECTION.

The meat-inspection work of the year shows an increase over the preceding year in the number of animals slaughtered, in the amount of meat food products prepared, and in the amount of meat and meat food products exported.

Inspection was conducted during the fiscal year at 936 establishments located in 255 cities and towns, as compared with 919 establishments in 237 cities and towns during the fiscal year 1910.

Inspection was inaugurated at 108 establishments and was withdrawn from 78 establishments during the year, as compared with 105 and 91 establishments, respectively, during the fiscal year 1910. In 68 cases the cause of withdrawal was that the establishments discontinued slaughtering or interstate or regular business; in 6 cases withdrawal was due to insanitary conditions, failure to meet requirements of the department, or to violation of the regulations; while in 4 cases the inspection was withdrawn by request.

The following statement shows the number of establishments and the number of cities and towns where the inspection of meat and meat food products has been conducted by the bureau in each fiscal year, beginning with 1891:

Number of establishments and number of cities and towns where meat inspection has been conducted, fiscal years 1891 to 1911, inclusive.

Years.	Estab- lish- ments.	Cities and towns.	Years.	Estab- lish- ments.	Cities and towns.	Years.	Estab- lish- ments.	Cities and towns.
1891.....	9	6	1898.....	135	35	1905.....	151	52
1892.....	23	12	1899.....	139	42	1906.....	163	58
1893.....	37	16	1900.....	149	46	1907.....	708	186
1894.....	46	17	1901.....	157	52	1908.....	787	211
1895.....	55	19	1902.....	155	50	1909.....	876	240
1896.....	102	26	1903.....	156	50	1910.....	919	237
1897.....	128	33	1904.....	152	51	1911.....	936	255

During the fiscal year market inspection was extended to 2 more cities, making a total of 41 cities at whose public markets Federal meat inspection is conducted in order that interstate deliveries may be made without violating the meat-inspection law and regulations.

ANTE-MORTEM INSPECTIONS.

The number of animals of each species inspected before slaughter is given in the following statement, which shows an increase in the number of sheep and swine inspected and a decrease in the number of cattle, calves, and goats inspected, making the total ante-mortem inspections 7.5 per cent greater than for the previous year.

Ante-mortem inspections of animals, fiscal year 1911.

Kind of animals.	Passed.	Sus- pected. ¹	Total in- spected.
Cattle.....	7,762,473	45,239	7,807,712
Calves.....	2,211,187	2,940	2,214,127
Sheep.....	13,001,932	3,890	13,005,822
Goats.....	54,373	9	54,382
Swine.....	29,892,489	27,772	29,920,261
Total.....	52,922,454	79,850	53,002,304

¹ This term is used to designate animals found or suspected of being unfit for food on ante-mortem inspection, most of which are afterwards slaughtered under special supervision, the final disposition being determined on post-mortem inspection.

POST-MORTEM INSPECTIONS.

The inspections made at the time of slaughter are given in the following statement, which shows an increase of 7.7 per cent over the fiscal year 1910. As in the case of ante-mortem inspections, the increase was in the number of sheep and swine, while the other species show a decrease. Although over 2,000,000 more hogs were slaughtered than in 1910, the number was 12.4 per cent less than the average for the fiscal years 1907, 1908, and 1909.

Post-mortem inspections, fiscal year 1911.

Kind of animals.	Passed for food.	Passed for lard and tallow only.	Condemned.	Total.
Cattle.....	7,738,452	3,176	39,402	7,781,030
Calves.....	2,212,252	2	7,654	2,219,908
Sheep.....	12,994,681	32	10,789	13,005,502
Goats.....	54,084		61	54,145
Swine.....	29,777,386	79,500	59,477	29,916,363
Total.....	52,776,855	82,710	117,383	52,976,948

In the foregoing table are included the post-mortem inspections of the carcasses of animals "suspected" on ante-mortem inspection, the final inspections of carcasses that were "retained" at the time of slaughter, and the carcasses of animals slaughtered without ante-mortem inspection and presented to official establishments with the head and viscera attached.

The various diseases and conditions for which fresh carcasses and parts were condemned and tanked are shown in the following table:

Diseases and conditions for which condemnations were made on post-mortem inspection, fiscal year 1911.

Causes of condemnation.	Cattle.		Calves.		Swine.		Sheep.		Goats.
	Car-casses.	Parts.	Car-casses.	Parts.	Car-casses.	Parts.	Car-casses.	Parts.	
Tuberculosis.....	27,186	49,262	204	131	31,517	870,361	1		
Actinomycosis.....	547	60,696	26	180					
Caseous lymphadenitis.....							1,078		3
Hog cholera.....					10,721				
Tumors and abscesses.....	156	6,938	27	85	1,086	1,339	131	47	2
Septicemia, pyemia, and uremia.....	1,320		440		6,056		705		5
Pregnacy and recent parturition.....	221				40		42		1
Immaturity.....			3,533						
Pneumonia, pleurisy, enteritis, hepatitis, peritonitis, metritis, etc.....	2,281		525		4,601		1,838		10
Icterus.....	49		31		1,594		939		3
Texas fever.....	480		1,120						
Injuries, bruises, etc.....	2,222	1,825	373	255	412	4,357	621	121	2
Sexual odor.....					1,126				
Asphyxiation.....					633		51		
Emaciation.....	4,492		1,203		690		5,038		29
Miscellaneous.....	448	5,248	172	130	1,001	1,471	345	7,226	6
Total.....	39,402	123,969	7,654	781	59,477	877,528	10,789	7,394	61

In addition to the foregoing there were tanked the carcasses of animals found dead or in a dying condition as follows: Cattle, 685; calves, 844; swine, 20,906; sheep, 3,787; goats, 8; total, 26,230.

SUPERVISION OF PREPARATION OF MEATS AND PRODUCTS.

The amount of meats and meat food products prepared and processed under the supervision of the bureau is shown in the following statement, being an increase of 11.4 per cent over the fiscal year 1910.

¹ This term is applied to carcasses held on suspicion on first post-mortem examination to be subjected later to more thorough examination for determining final disposition.

Meat and meat food products prepared and processed under bureau supervision, fiscal year 1911.

Kind of products.	Weight.	Kind of products.	Weight.
	<i>Pounds.</i>		<i>Pounds.</i>
Beef placed in cure.....	317,467,933	Bakers' compound.....	2,617,743
Pork placed in cure.....	2,568,148,924	Oleo stock and edible tallow.....	70,319,941
All other classes placed in cure.....	2,436,957	Oleo oil.....	171,006,496
Sausage chopped.....	488,814,318	Oleo stearin.....	87,616,254
Canned beef.....	116,100,087	Oleomargarin or butterine.....	117,848,120
Canned pork.....	25,270,451	Mutton stock.....	1,211,610
All other canned meats.....	3,571,805	Mutton oil.....	2,957,821
Meat extract.....	361,870	Mutton stearin.....	2,198,576
Steam and kettle rendered lard.....	1,086,628,132	Oleo and mutton stock.....	12,871
Leaf lard.....	18,090,259	Oleo and mutton oil.....	1,509,685
Neutral lard.....	80,784,960	Oleo and mutton stearin.....	222,274
Lard oil.....	6,521,840	Miscellaneous products.....	1,187,038,790
Lard stearin.....	5,248,560		
Lard compound.....	5,521,196	Total.....	6,934,233,214
Lard substitute.....	664,705,741		

The following quantities of meats and meat food products were condemned on reinspection during the fiscal year because of having become sour, tainted, putrid, unclean, rancid, or otherwise unwholesome: Beef, 12,106,336 pounds; pork, 8,747,016 pounds; mutton, 176,414 pounds; veal, 43,470 pounds; goat meat, 341 pounds; total, 21,073,577 pounds. This is an apparent increase of 10.7 per cent over the previous year, but subtracting from these figures the large amount of product condemned at one establishment on account of an extensive fire (over 3,000,000 pounds), and taking into consideration the great increase in the amount of meat food products prepared during the fiscal year (over 700,000,000 pounds), the proportionate amount of product condemned on reinspection shows a gratifying decrease, which indicates continued improvement in sanitary conditions and in methods of preparing and handling the products.

INTERCHANGE OF MEATS BETWEEN INSPECTED ESTABLISHMENTS.

Considerable quantities of meats and meat food products that have been inspected and passed are transferred between inspected establishments, this traffic being closely supervised and the meats and products identified by means of marks and seals. During the fiscal year there were transferred in this manner 3,126,643,825 pounds of meats and meat food products, part of which was contained in 17,884 sealed cars and 17,067 sealed wagons.

MEATS AND PRODUCTS CERTIFIED FOR EXPORT.

The quantities of meat and meat food products certified by the bureau for export are shown in the following table, being an increase of 19.7 per cent over the fiscal year 1910:

Inspection certificates issued for export of meat and meat food products, fiscal year 1911.

Kinds.	Number.	Beef.	Mutton.	Pork.	Total.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Regular.....	60,953	221,460,262	5,096,152	542,728,179	769,881,593
Preservative.....	29,471	1,981,081	203,200,332	205,181,413	
Total.....	90,424	223,441,343	5,606,152	745,928,511	975,066,006

There were also issued 2,836 "inedible product" certificates covering exports of 25,553,053 pounds of such inedible products as hoofs, horns, casings, bladders, bungs, etc.

EXEMPTION FROM INSPECTION.

The provisions of the meat-inspection law requiring inspection do not apply to animals slaughtered by farmers on the farm nor to retail butchers and dealers. The department requires that such butchers and dealers, in order to ship meats and meat food products in interstate commerce, shall first obtain certificates of exemption, but no such requirement is made of farmers. The number of certificates of exemption outstanding at the close of the fiscal year was 2,546, as against 2,428 at the close of the previous fiscal year—an increase of 118 certificates. During the year it was found necessary to call in and cancel for various causes 405 certificates of exemption. In many of these cases, however, the certificates were reissued later when business was resumed or when insanitary conditions had been corrected.

During the past fiscal year retail butchers and dealers, shipping under certificates of exemption, have been requested to give a more detailed description of the meats and meat food products shipped, so that it is now possible to show the shipments of carcasses by species and to give the separate amounts of the different classes of fresh meats shipped. During the year 116,536 shipments were made, covering products as shown in the following table:

Shipments made under certificates of exemption from inspection during the fiscal year 1911.

Kind of products.	Number.	Pounds.	Kind of products.	Number.	Pounds.
Beef, quarters.....	2,629	252,945	Cured meats.....		1,308,268
Calves, carcasses.....	77,667	6,363,152	Lard.....		88,977
Sheep, carcasses.....	5,324	202,623	Sausage.....		178,657
Swine, carcasses.....	1,477	146,641	Miscellaneous (scrapple, tripe, head cheese, beef fat, etc.).....		253,170
Beef, fresh.....		8,209,576			
Veal, fresh.....		593,475			
Mutton, fresh.....		1,672,424			
Pork, fresh.....		547,969	Total.....	87,097	19,817,877

INSPECTIONS FOR THE NAVY.

Upon request of the Navy Department occasional inspections of meats and meat food products were made for the Navy during the year. The meats and products inspected aggregated 11,112,060 pounds, of which 405,459 pounds were rejected. Rejections were made on account of the sour, slimy, tainted, or putrid condition of the product, for failure to comply with the specifications regarding weight or the amount of fat, and because of the substitution of buck, bull, heifer, or cow meat for the meat of wethers and steers. There were also inspected for the Navy 68,682 dozen eggs, 17,962 dozen of which were rejected.

CONTROL OF CONTAGIOUS DISEASES.

TEXAS FEVER.

The number of cattle shipped from the quarantined area to northern markets during the quarantine season of 1910 was 1,065,119, being a decrease of 329,539 head, or 23.6 per cent, as compared with the pre-

vious year. Since the quarantine now extends throughout the year, and it is desired to have this report cover the fiscal instead of the calendar year, the following figures are given for the 18 months from January 1, 1910, to June 30, 1911: Cattle shipped to northern markets, 1,325,060, which were transported in 48,563 cars, 37,180 of which were reported as having been cleaned and disinfected under bureau supervision. Reshipments were made from quarantine pens of 359,833 cattle carried in 13,208 cars.

The number of cattle of the quarantined area inspected during the fiscal year 1911, and permitted unrestricted movement as provided in the regulations, under 983 certificates of inspection issued by bureau inspectors, was 103,338, a decrease of 28 per cent as compared with 1910. Of this number of cattle moved under certificate, 45,613 were dipped or otherwise treated as provided in the regulations, which is an increase of 30 per cent over the number so dipped or treated in the previous year.

TICK ERADICATION.

As the result of the work done in cooperation with authorities of various Southern States for the extermination of the ticks which spread the infection of Texas fever of cattle, areas aggregating 10,965 square miles, as shown by the following table, were released from quarantine during the fiscal year:

States.	Square miles.	States.	Square miles.
Mississippi.....	625	Texas.....	1,976
North Carolina.....	3,794	Virginia.....	773
Oklahoma.....	2,142		
Tennessee.....	1,655	Total.....	10,965

In addition to the States named, operations are being carried on in the States of South Carolina, Georgia, Alabama, Louisiana, Arkansas, Missouri, and California.

During the year the total number of inspections made by bureau employees was 4,016,448, of which 3,160,255 were reinspections. This is an increase of 7.2 per cent over the inspections of the previous year.

SCABIES IN SHEEP.

During the fiscal year 1911 the area quarantined for scabies in sheep was reduced by releasing from quarantine that portion of Oregon lying west of the Cascade Mountains, an area of 22,560 square miles.

The number of inspections made by bureau employees during the year was 56,584,129, an increase of 7.26 per cent over the inspections of the fiscal year 1910. The number of dippings supervised by bureau employees during the year was 12,715,631, an increase of 4.62 per cent as compared with the previous year. Bureau employees also supervised the cleaning and disinfection of 2,143 cars. The increase in the number of inspections and dippings of sheep is due to scabies eradication work being taken up in the State of Kentucky, where over half a million sheep were inspected; also to the increased movement of sheep from the western ranges to market centers, and to a local outbreak of scabies in two counties in Wyoming, which necessitated the making of a large number of inspections in order that the extent of the outbreak might be fully ascertained.

SCABIES IN CATTLE.

The area quarantined for scabies in cattle was reduced during the fiscal year by releasing 14,810 square miles, consisting of two counties in South Dakota, eight counties and a part of one other county in Nebraska, and five counties in Kansas.

The number of inspections made during the year was 18,593,251, a slight increase over the previous year. The number of dippings supervised was 1,234,123, a decrease of 7.68 per cent, and 5,761 cars were cleaned and disinfected.

SCABIES IN HORSES.

The number of horses and mules inspected for scabies during the fiscal year was 3,550 and the number dipped was 124, a decrease of 69.8 per cent in the number inspected and of 89.8 per cent in the number dipped.

GLANDERS IN HORSES.

There were inspected for glanders at Indian schools and agencies 52,088 horses and mules, of which 68 were found to be diseased and 252 exposed to the disease. This is an increase of 220 per cent over the number inspected in 1910. This work was done in cooperation with the Office of Indian Affairs of the Department of the Interior.

LIP-AND-LEG ULCERATION OF SHEEP.

The area under quarantine for lip-and-leg ulceration (necrobacillosis) among sheep was reduced by 34,086 square miles during the fiscal year, leaving only 22,175 square miles still in quarantine on June 30, and this entire area has since been released (Aug. 10, 1911). The number of inspections during the year for this disease was 6,459,790. The number of sheep dipped and hand treated in compliance with the regulations was 1,102,516.

INSPECTION OF LIVE STOCK FOR INTERSTATE MOVEMENT.

The work of inspecting and testing with tuberculin cattle for interstate movement was assigned to the Inspection Division at the beginning of the fiscal year, and veterinarians at numerous stations were instructed to inspect and test with tuberculin, when such testing was required by the laws of the State or Territory to which the animals were destined, cattle moving interstate for purposes other than immediate slaughter. During the fiscal year such inspection was made of 52,230 animals, of which 18,778 were tested with tuberculin. Of those tested, 467 were found to be diseased with tuberculosis and 81 showed temperatures which required them to be held as suspects for further examination.

During the fiscal year there were also inspected by bureau veterinarians 34,789 horses and mules intended for interstate movement. Of this number 5,789 animals were tested with mallein, 175 showed typical reactions to the test, and 174 were held as suspicious and refused interstate certificates until further investigation could be made.

VIOLATIONS OF LIVE-STOCK TRANSPORTATION LAWS.

During the fiscal year a large number of reports of alleged violations of laws concerning the interstate transportation of live stock were submitted by bureau employees, and 969 such cases (793 of

which were for violation of the so-called 28-hour law and 176 for violation of the act of Mar. 3, 1905, and quarantine regulations based thereon) were referred to the Department Solicitor, who in turn presented to the Department of Justice for prosecution such as seemed to be supported by sufficient evidence. Many of the cases tried in court required special investigations and the collection of evidence by employees of the bureau who cooperated with the United States attorneys in charge of the cases.

THE QUARANTINE DIVISION.

The Quarantine Division, of which Dr. R. W. Hickman is the chief, supervises work of the bureau in connection with the exportation and importation of live stock, including the inspection and equipment of vessels carrying export animals, the management of quarantine stations at the various ports of entry for imported animals, and the inspection and disinfection of imported hay, hides, wool, etc. It also conducts investigations concerning bovine tuberculosis in cooperation with State and municipal authorities and investigations of animal diseases in Porto Rico and the Hawaiian Islands, and carries on correspondence relating to miscellaneous animal diseases.

INSPECTION OF VESSELS AND EXPORT ANIMALS.

During the fiscal year 438 inspections of vessels carrying live stock were made before clearance, and 764 certificates of inspection were issued for American cattle, sheep, and horses. The following table gives statistics of inspection of live animals for export during the year:

Inspections of American and Canadian animals for export, fiscal year 1911.

Kind of animals.	American.				Canadian.		
	Inspections.	Rejected.	Tagged.	Exported.	Inspections.	Rejected.	Exported.
Cattle.....	268,531	141	138,541	135,748	32,330	5	32,325
Sheep.....	98,277	42	.....	55,952	140	.....	140
Swine.....	23	.....	.....	23	.....	.....	.....
Horses.....	1,450	.....	.....	1,579	.....	.....	.....
Mules.....	2,064	.....	.....	2,064	.....	.....	.....
Asses.....	4	.....	.....	4	.....	.....	.....
Goats.....	19	.....	.....	19	.....	.....	.....
Zebra.....	1	.....	.....	1	.....	.....	.....
Total.....	370,369	183	138,541	195,390	32,470	5	32,465

Most of the animals included in the above statement were shipped to Great Britain, namely, of American animals, 134,572 cattle, 37,051 sheep, 678 horses, and 8 mules, and of Canadian animals, 32,225 cattle.

As a result of the inspection of the equipment of vessels carrying export animals, statistics show a reduction in the already low percentage of loss of animals at sea. Of cattle landed at British ports but 0.09 per cent were lost at sea, and of sheep but 0.50 per cent were lost.

During the fiscal year 13,404 horses and 1,046 mules were inspected and tested with mallein by bureau veterinarians for shipment to Canada. Of this number 251 horses and 12 mules were rejected on account of having reacted to the test.

For shipment to Canada there were also tested with tuberculin 460 cattle, of which 16 reacted; and inspections were made of 28,428 sheep, 25 goats, and 110 swine.

For shipment to the Hawaiian Islands there were tested with tuberculin 93 cattle, of which 5 reacted, and the mallein test was applied to 555 horses and 466 mules, of which 23 horses and 16 mules reacted.

Reacting animals were excluded from exportation.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

Owing to the existence of communicable diseases of animals among the live stock of various parts of the world, importations from overseas have been mainly restricted to Great Britain, Ireland, and the Channel Islands, and during a portion of the fiscal year importations from Great Britain were not permitted on account of an outbreak of foot-and-mouth disease. It is required that a permit be procured from the Secretary of Agriculture prior to the shipment from countries other than North America of cattle, sheep, and other ruminants and swine for their landing subject to inspection and for their detention in quarantine at one of the Federal quarantine stations at the port of entry. Horses are admitted subject to inspection and without quarantine. Dogs imported from any part of the world except North America are subject to inspection or inspection and quarantine for a period not to exceed two weeks or until it can be determined whether such dogs are the hosts of the tapeworm (*Tenia caninus*) which produces gid in sheep. The number of animals imported during the fiscal year is shown in detail by the following tables:

Number of imported animals inspected and quarantined, fiscal year 1911.

Ports of entry.	Cattle.	Sheep.	Swine.	Goats.	Other animals.
New York.....	1,915	221	43	.....	136
Boston.....	242	1,283	14	.....	.....
Baltimore.....	.....	2	.....	.....	2
Canadian border ports.....	147	88	32	2	.....
Total.....	2,304	1,594	89	2	138

Number of imported animals inspected but not quarantined, fiscal year 1911.

Ports of entry.	Cattle.	Sheep.	Swine.	Horses and ponies.	Mules and asses.	Burros.	Donkeys.	Zebbras.	Goats.	Deer.	Other animals.
New York.....	.....	.....	.....	4,687	.....	.....	11	2	.....	.....	.....
Boston.....	.....	.....	.....	81	4	.....	.....	.....	.....	.....	.....
Philadelphia.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	13
Baltimore.....	.....	.....	.....	65	10	.....	.....	.....	.....	.....	.....
Portland, Me.....	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....
San Francisco.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....
New Orleans.....	.....	.....	.....	6	4	.....	.....	.....	.....	.....	.....
Mexican border ports.....	181,509	2,083	357	3,051	2,220	20	.....	.....	7,964	16	5
Canadian border ports.....	2,347	45,829	2,096	4,712	34	1	3	1	8	.....	197
Total.....	183,856	47,912	2,453	12,616	2,273	21	14	3	7,972	16	215

TUBERCULIN TESTS IN GREAT BRITAIN.

The regulations governing the importation of animals subject to inspection and quarantine provide that all cattle 6 months old or over, imported from Great Britain, Ireland, and the Channel Islands

shall be tested with tuberculin by an inspector of the Bureau of Animal Industry before being exported or after arrival at the animal quarantine station at the port of entry. The following table shows the results of such tests made in Great Britain during the fiscal year:

Results of tuberculin tests in Great Britain of cattle for importation, fiscal year 1911.

Breeds.	Passed.	Failed.	Breeds.	Passed.	Failed.
Alderney.....	158	0	Jersey.....	1,055	6
Ayrshire.....	151	36	Shorthorn.....	12	3
Black Polled Angus.....	2	0	Sussex.....	1	1
Dexter.....	39	0	Total.....	2,210	58
Guernsey.....	812	12			

NEW QUARANTINE STATION FOR BALTIMORE.

With an appropriation made by Congress the bureau was successful in purchasing for a quarantine station for the port of Baltimore a tract of land at Turners Station on the Baltimore & Sparrows Point Railway, with the tracks crossing the east side of the property, and a good water front on the Patapsco River, about 4 miles from the cattle steamer docks and within the lighterage area. The work of erecting fences and constructing buildings is being pushed as rapidly as possible in order to provide early accommodations for importers who desire to use this port of entry. This station when completed will be the only animal quarantine station located on a water front.

SUPPRESSION OF BOVINE TUBERCULOSIS.

TUBERCULIN TESTING OF CATTLE IN VIRGINIA AND MARYLAND.

The tuberculin testing of cattle in Virginia and Maryland, which was started in 1907 in cooperation with the health department of the District of Columbia, and which in 1910 was extended to cooperation with the dairy and food commissioner of the State of Virginia, has been continued throughout the past year with encouraging progress and results. This is evidenced by the increased number of cattle tested, the marked reduction in the percentage of reacting animals in previously tested herds, and the confirmation of reactions to the tuberculin test among slaughtered animals to the extent of 98.27 per cent. The results of these tests are shown in the following tables:

Results of tuberculin testing of dairy cattle in Virginia and Maryland, fiscal year 1911.

Items.	Number of cattle tested.	Number passed.	Number reacted.	Number of suspects.	Percentage of reactors and suspects.
Virginia:					
Cattle not previously tested.....	1,924	1,660	255	9	13.72
Annual retests.....	2,403	2,312	77	14	3.79
Total.....	4,327	3,972	332	23	8.20
Maryland:					
Cattle not previously tested.....	1,134	907	211	16	20.02
Annual retests.....	713	676	35	2	5.17
Total.....	1,847	1,583	246	18	14.29
Cattle not previously tested, both States.....	3,058	2,567	466	25	16.06
Annual retests, both States.....	3,116	2,988	112	16	4.10

The total number of cattle in Virginia and Maryland tested during the fiscal year was 6,174, which was an increase of 3,456 over the number tested during the previous year. Of this total, 5,555 passed, 578 reacted, and 41 were regarded as suspicious, making a general percentage of reactors and suspects of 10.02.

Post-mortem examination of the carcasses of reactors that were slaughtered under bureau supervision showed 80.16 per cent to be affected with localized tuberculosis, while 18.11 per cent showed generalized lesions, and lesions were not found in 1.73 per cent.

ERADICATION OF BOVINE TUBERCULOSIS IN THE DISTRICT OF COLUMBIA.

The work of eradicating tuberculosis from the District of Columbia, which was undertaken in the fall of 1909 in cooperation with the Commissioners of the District, was continued throughout the fiscal year 1911 by the systematic retesting, at intervals of approximately six months, of all cattle which had been upon premises found to have been infected at the time of the first test, and the retesting of all other cattle in the District after an interval of one year. These latter retests are not yet completed. The tuberculin test was also applied to all cattle entering the District of Columbia for purposes other than immediate slaughter. A considerable number of persons who were cattle owners at the time the order of the Commissioners became effective have since ceased to keep cattle, thus reducing the number of premises, although the total number of cattle within the District of Columbia has undergone but slight variation.

Cattle were found on 80 of the previously infected premises, and the retesting disclosed infection on only 12 of these premises, thus showing a reduction of 85 per cent in the number of infected premises since the original tests. The number of cattle retested on previously infected premises was 798, of which 764 passed, and 34 or 4.26 per cent reacted. All of these reactors have been slaughtered, and in every instance post-mortem examination showed lesions of tuberculosis. These lesions were found to be localized in 85.29 per cent of the carcasses and generalized in 14.71 per cent.

Annual retests were applied to 484 cattle upon 278 premises which appeared to be free from infection at the time of the first test. Of these 477 passed, and 7 reactors were found. Seven, or 2.52 per cent, of newly infected premises were thus discovered by these retests, representing 1.45 per cent of tuberculous cattle. The 7 reactors were slaughtered, and in each instance showed localized lesions of tuberculosis of such a character that it was evident that the disease had been contracted since the original testing of these animals.

The combination of the results of the retests of cattle within the District upon previously infected and upon previously free premises shows that 1,282 cattle were retested upon 358 premises. Of these 1,241 passed and 41 reacted, the percentage of reactors being 3.20, with signs of infection showing upon 5.31 per cent of the premises. Forty of the reactors have been slaughtered, and tuberculosis was demonstrated upon post-mortem examination in each instance, 87.5 per cent of the carcasses showing localized lesions and 12.5 per cent showing generalized lesions.

An important feature for the control of tuberculosis within any definite area is the prevention of the introduction of additional cases

of tuberculosis from the outside. The regulations governing the admission and tuberculin testing of cattle entering the District were therefore stringently enforced, and 685 cattle were tagged, quarantined, and submitted to the tuberculin test. The majority of these were brought into the District in lots by cattle dealers, while the remaining portion represented the entries of private cows. In the case of the dealers, for commercial reasons the cattle were tested as soon as practicable after their arrival within the District, the cattle being housed in unaccustomed surroundings. Thirty-two reacted to the test, and of the 28 slaughtered lesions of tuberculosis were found in 27 carcasses, in spite of the unfavorable conditions under which tests were applied. Two of the reacting cows were slaughtered through mistakes of their owners, without an opportunity being given for post-mortem examinations, and the remaining two cows are yet to be slaughtered. The low percentage of tuberculosis in cattle brought into the District, compared with the percentage of tuberculosis found by bureau tests applied in Virginia and Maryland, is attributable to the fact that the dealers have been shown by the results of the test which localities or herds show the greatest freedom from tuberculosis.

The following is a summary of all tuberculin tests applied in connection with bovine tuberculosis in the District of Columbia during the fiscal year:

Total number of cattle tested.....	1,967
Number passed.....	1,894
Number reacting.....	73
Percentage of reactors.....	3.71
Reactions confirmed by post-mortem examination..... per cent..	98.53
Failure to demonstrate tuberculosis (1 cow).....do....	1.47

Under the provision requiring the identification and tagging of cows and bulls entering the District for slaughter purposes, 831 tags were attached for 35 shippers.

These investigations will be continued throughout the coming fiscal year.

BOVINE TUBERCULOSIS UPON INDIAN RESERVATIONS.

The arrangements for cooperation with the Office of Indian Affairs of the Department of Interior in the investigation of bovine tuberculosis and dairy conditions at the various Indian schools and reservations was conducted as arranged during the previous fiscal year. Tuberculin tests were applied by bureau inspectors to a total of 1,600 cattle upon 86 premises. Of these animals 1,538 passed satisfactory tests, 38 reacted, and the remaining 24 were regarded as suspicious. As a result of these tests, applied in various States, to cattle which were maintained largely under natural conditions in the open upon the reservations, it was found that the percentage of tuberculosis was 3.88.

LIVE-STOCK DISEASES IN PORTO RICO AND HAWAII.

Efforts for the control of communicable diseases among animals in Porto Rico and Hawaii, and for the education of the natives of these two countries in regard to the importance of such measures, have been

continued throughout the past year under the supervision of Dr. Thomas A. Allen, bureau inspector in Porto Rico, and Dr. Victor A. Nörsgaard, territorial veterinarian and bureau inspector in Hawaii. The control of glanders and tuberculosis has received special consideration in Hawaii.

THE PATHOLOGICAL DIVISION.

The Pathological Division, of which Dr. John R. Mohler is chief, is mainly engaged in the scientific investigation of animal diseases.

COMPLEMENT-FIXATION TEST FOR GLANDERS.

Prominent among the new lines of laboratory investigation conducted by this division may be mentioned the complement-fixation test as applied to the diagnosis of glanders. The results obtained from the use of this method have been very satisfactory and have proved it to be most reliable in the detection of occult or latent cases of glanders.

As a result of the recent publication of Bulletin 136, descriptive of this test, different State and city laboratories have undertaken the work of applying it to the diagnosis of glanders, the bureau furnishing detailed information to all those interested in the work, and also material (glaners bacilli extract or hemolytic amboceptors) necessary for the test.

Samples of blood from horses suspected of being affected with glanders have been received and tested daily at the laboratory. About 1,500 tests have thus been made. The results show the specificity of the test, as normal horses and those affected with diseases other than glanders gave no reaction, while those affected with glanders gave positive fixations.

A modification of the agglutination test has been employed in a large number of cases in conjunction with the complement-fixation test, to great advantage. In this modification the agglutination in the test tubes is hastened by centrifugalization, and the results may be read after the tubes have been placed in an incubator for two hours. Thus the two tests can be worked together without much difficulty and greater accuracy of diagnosis can thereby be secured.

GLANDERS IN LIONS.

Blood from a lion belonging to a circus troupe passing through Kansas and Iowa was forwarded to this laboratory for examination. The veterinarian in charge supplied the following information:

Bleeding from the nose, ulcers in the nostrils, sores on the legs, face, feet, and back. Condition has existed for some six weeks. Twelve other lions similarly affected.

The serum of this blood gave positive results to both complement-fixation and agglutination tests for glanders. Cases of glanders in zoological gardens among the carnivora are not infrequent, and in most instances the disease assumes an enzootic form. The animals of the feline family are more susceptible than those belonging to the canine family. In almost all outbreaks the feeding of meat of horses affected with glanders was the medium by which the disease was disseminated.

THE RECURRENCE OF DOURINE IN THE UNITED STATES.

On May 27, 1911, the bureau received a letter from Dr. J. I. Gibson, State veterinarian of Iowa, stating that there was in Taylor County an outbreak of a disease of horses, suspected of being dourine, and requesting that an expert be sent to make an investigation. The disease had been reported by Dr. A. H. Quin, a practitioner of Creston, Iowa, and his diagnosis was subsequently confirmed on the part of the bureau by Drs. A. D. Melvin, John R. Mohler, and E. T. Davison, who were of the unanimous opinion that the symptoms and lesions manifested were the most typical of any of the cases they had observed. Three of the affected mares were at once purchased and sent to Washington for experimental purposes. After a careful and prolonged examination of almost 200 microscopic slides, six living, wriggling trypanosomes (*Trypanosoma equiperdum*) were found on June 28, 1911, in the blood-tinged serum obtained from a recently developed plaque on the abdomen of one of the mares, thus confirming the diagnosis and also establishing the identity of the disease with that of Asia, Africa, and continental Europe. These trypanosomes have always been very scanty and are only found after prolonged and tedious examination. This is the first discovery of the *T. trypanosoma equiperdum* in the natural cases of dourine in the United States, although in 1903 considerable work was done with this trypanosome imported from France and subsequently inoculated into horses at the Bethesda Experiment Station. Previous to 1911 there had been no authentic cases of dourine reported among the horses of the United States since 1906, although there had been a number of alleged or suspected cases brought to the bureau's attention from time to time which demanded a full investigation, but always with negative results.

In the outbreak of dourine recently discovered in Taylor County, Iowa, 5 stallions have been found affected and 5 exposed to this disease. One of the former stallions has since died of the infection. In addition, 9 mares have shown symptoms of dourine, 1 of which subsequently died of the disease, 5 are suspicious cases, and 94 have been exposed but at present show no evidence of infection. These diseased animals, together with all exposed stallions and mares, were immediately quarantined by the State. Those showing lesions of the disease were purchased by the Government and destroyed, while the exposed animals are still in quarantine under observation. Several Federal and State inspectors are making farm-to-farm inspections with the view of discovering any latent or hidden cases, and it is now believed that the infection is entirely under control. The source from which this center of infection was derived is only a matter of conjecture, but there is apparently no connection between this and any of the previous outbreaks. No authentic information as to the origin of the outbreak has been discovered up to the present time, but all cases lead back to a Percheron stallion imported from France in 1909, and brought directly to Lenox, Iowa. The possibility of such animals bringing the infection into this country must be apparent from the following explanation:

Schneider and Buffard maintain that in France dourine appears nearly every year in the Department of Basses-Pyrénées on the Spanish frontier. It is stated that mares get infected by the asses or horses by which they are covered. It is the custom to have a mare

first covered by an ass, and if not impregnated she is then served by a stallion. The asses operate on both sides of the frontier, and in this way introduce the disease into France from Spain, where it has been known to occur for years, especially in Navarre.

A complete description of this disease, its cause, and methods of eradication, has recently been issued by the bureau as Bulletin 142.

RINGWORM OF SHEEP.

Recently a large wool house submitted to the bureau some interesting samples of diseased wool for diagnosis. A microscopic examination showed the hair shafts to be affected with spores and filaments of the fungus *Trichophyton tonsurans*, the causative agent of ringworm, involving the entire fiber of the clip to within one-half inch of the end of the hair. This is the first case of ringworm in sheep which has been reported to the bureau, and, owing to its rarity, sheep owners and herders are requested to take cognizance of the condition of the wool simulating this disease in order that both medical and preventive treatment may be applied before the disease has gained a strong foothold. While this disease occurs quite commonly in horses and cattle, and also in dogs and cats, the infection is infrequent in sheep and hogs.

In sheep the disease affects the wool and the outer layer of the skin and is contagious, being readily transmitted from one animal to another. It is characterized by the formation on the head, neck, chest, or back of round patches varying in size from a 5-cent piece to the palm of the hand, covered by bran-like epidermal scales. On the woolly portions of the body there is manifest the flattening of one or more small tufts of wool, which become irregularly matted or felted together, and when separated show a dense scurvy accumulation around the roots. By and by the wool is shed and may hang in tufts among the healthy fibers. The skin appears reddened, and in the center shows frequently a brownish discoloration. The itching is more or less pronounced, which causes the sheep to rub and injure the fleece, although the itching is not nearly so bad as in scabies.

The mode of infection consists in the penetration of the hair follicles by the fungus, where it multiplies and surrounds the base of the shaft with a complete mantle and then enters into its interior and renders it brittle and easily broken. The hairs at first become erect, and then appear dull, lusterless, devoid of elasticity, extremely fragile, and dead white in color, resembling strands of hemp or asbestos. Inflammation of the follicles is produced, which finally results in loosening and loss of the wool.

Ringworm can be readily differentiated from scabies by the dry, asbestos-like, brittle condition of the wool covering the lesion, as well as by the condition of the skin, which in scabies is markedly thickened and covered by crusts or scabs. Besides, the scab mites are absent, while the microscopic examination will show the presence of the fungus above mentioned.

The treatment should consist in clipping the wool from the affected parts and rubbing the lesions with either a 5 per cent carbolic vaseline or a mixture of soft soap, lard, and carbolic acid in the proportion of 1 part of carbolic acid, 5 parts of lard, and 10 parts of soft soap. This is an excellent preliminary treatment and is used in order to

soften the scabs and scales from the outer layer of the skin. After one or two days this is followed by the application of antiparasitic remedies, of which the ordinary blue ointment and tincture of iodine are among the best. Much better results will naturally be obtained after the sheep have been shorn. The infected animals should be separated from the healthy sheep and not returned to the band until the lesions have all disappeared.

NECROBACILLOSIS IN DOMESTIC ANIMALS.

While comparatively few cases of lip-and-leg ulceration of sheep came to the attention of this laboratory, a few very interesting cases of necrobacillosis of other domestic animals were received for diagnosis. Several calves at a local Government institution died of an unusual malady. The aid of the bureau was invoked, and upon autopsy marked indications of necrophorus invasion were evident. The mucous membrane of the rumen showed a marked denudation of epithelium and areas of irregular yellowish-gray necrotic patches. The reticulum was slightly inflamed. The omasum presented many elevated caseo-necrotic ulcers and patches on the mucosa. The abomasum and almost the entire intestinal tract were severely inflamed. The heart was studded with petechial hemorrhages. Smears made from the lesions in the rumen and omasum proved upon microscopic examination to be teeming with the characteristic long, beaded filaments of necrophorus bacilli. Lesions in the heart failed to show any microorganisms, thus eliminating bovis septicus as a possible causative agent. The veterinarian in charge of the live stock at that institution reported that the lesions in the other affected calves were similar to those found at the laboratory.

The lungs of a horse suspected by a veterinarian of being infected with glanders were found to be affected with necrotic pneumonia, caused by necrophorus bacilli. Upon further inquiry into the history of this case it was learned that the horse had also suffered from a severe attack of necrotic stomatitis.

Bovine lungs studded with nodules of various sizes, greenish yellow in color, were received for diagnosis. The contents of the nodules varied in consistency from gluey pus to a cheesy necrotic mass. Smears from these nodules revealed the presence of necrophorus bacilli. In all instances the microscopic findings were substantiated by animal inoculations. *Bacillus necrophorus* has likewise been isolated from a case of necrosis of the bovine udder in which the teats were primarily involved.

CHRONIC BACTERIAL DYSENTERY.

Owing to the increasing recognition of the importance of chronic bacterial dysentery as an infectious disease of widespread occurrence and its questionable relationship to tuberculosis, considerable work has been done in an attempt to grow the causative microorganism in pure culture on artificial media, so that its biological characteristics might be studied and animal-inoculation experiments carried on. During the past year several specimens of cattle intestines and feces received in the laboratory from the States of Oregon and Virginia and the District of Columbia were found to contain the acid-fast bacillus of this disease. From this material numerous inoculations were made

on the ordinary culture media with negative results. A special medium was then prepared from the mucous lining of the intestines of a cow; and while it appeared that the implanted bacilli had multiplied in some of the tubes, the results were not sufficiently definite. Another special medium, consisting of ground tubercle bacilli and agar, was used for a series of inoculations, but likewise failed to produce a growth. In all of these experiments the bacilli to be inoculated on the culture media were secured by dissolving the infected intestinal mucosa in an antiformin solution of sufficient strength to destroy all other organisms present, it being assumed that as the bacilli of chronic bacterial enteritis are not dissolved readily by strong antiformin solutions they retain their vitality, as is the case with tubercle bacilli.

SWAMP FEVER.

Leaving out of consideration the experiments which have not yet been completed and those which have merely corroborated statements already published, the results of the work of the past year on swamp fever of horses have been largely negative. The observations gathered, however, have suggested new lines of attack, which promise to lead to more definite results. The investigation of this disease has reached a stage where it is absolutely essential that an accurate and early method of diagnosis be discovered, inasmuch as without this it is impossible to determine accurately the value of any line of experimental treatment, the progress of experiments in immunizing, or to establish the identity of the disease in localities where it has not previously been recognized. Experiments having this object in view are now in progress.

Experiments have been undertaken to determine whether the complement-fixation method of diagnosis, which has been found so accurate with glanders, can not be utilized also in swamp fever. For the antigen, shake extracts were prepared from the spleen, liver, and heart muscle of an animal dead of the disease. These different extracts were employed in dilutions established by titrations. The complement-fixation test was then applied with sera of horses affected with swamp fever and also with sera of horses suffering from other diseases, as well as with sera of normal horses. The results obtained showed that a partial fixation of the complement had taken place in all tubes containing serum from horses affected with swamp fever, while in all other tubes complete hemolysis was present. The fixation was most pronounced in the tubes in which the spleen extract had been used as antigen. Further experiments will determine whether it will be possible to employ this test for the diagnosis of swamp fever, as the limited number of cases examined do not warrant definite conclusions.

The experiments in treatment with various medicinal agents have not been satisfactory, because it has been impossible to determine accurately the results of treatment. Owing to this lack of a diagnostic method, it has been impossible to determine the real value of treatment even in cases where it had been apparently beneficial.

TUBERCULOSIS INVESTIGATIONS.

An opportunity was offered during the year to gain a valuable amount of material for study from hogs that had been raised at an insane asylum, where they had been fed upon garbage collected at

the kitchen of the section in which the tuberculous insane were kept. Six of the animals kept under these conditions were found to be tuberculous at autopsy, and from their lesions cultures were obtained that were satisfactory for study. Of this number two cultures presented the characteristics of the human type of tubercle bacilli. They were not rapidly fatal to rabbits, were more or less long, curved, and beaded in conformation, and were prompt to produce visible growth when planted upon culture media. The bacilli obtained from the remaining four hogs were short and straight, and caused the death of the test rabbits in from 19 to 22 days, thus demonstrating their bovine origin.

The ophthalmic and intradermal tests for the detection of tuberculosis in cattle have received additional attention. These methods thus far have not proved sufficiently superior to the subcutaneous injection of tuberculin to warrant their general application in practice, although they are still being tested whenever suitable opportunities are offered. A special preparation known as "phymatin" has been used in the ophthalmic test and has given better results than the alcoholic-precipitated tuberculin. The ophthalmic and intradermal methods of applying the tuberculin test possess so many advantages, especially in the simplicity of reading the results, that the absolute acceptance of either one would be a great aid in the eradication of tuberculosis. Both methods obviate the laborious operation of taking temperatures repeatedly during the day after the injection, and no preliminary temperatures are required.

Determined efforts are being made in certain sections of the country to eradicate tuberculosis from among the dairy cattle of those regions. In the course of the tuberculin testing necessary for the accomplishment of this desired end there will occasionally be found animals that apparently react to tuberculin but in whose bodies no lesions of tuberculosis can be found at the time of autopsy. Lymph glands from a number of these cases have been forwarded to the Pathological Division for bacteriological examination, and in many instances it is found that the tuberculin reaction was correct, although the tuberculous lesions were not well advanced. In this class of cases the demonstration of living tubercle bacilli within the tissues affords sufficient justification of the tuberculin reaction.

RABIES.

The diagnosis of rabies by the examination of brain tissues of suspected animals forwarded to the bureau forms an important part of the routine work of the Pathological Division. During the fiscal year rabies has been diagnosed from various sections within easy reach of Washington, and by studying the histories of the cases it can be readily understood how rabies may exist in an enzootic form where a large number of animals have been bitten and no adequate measures for control instituted. An instance of this is seen in an enzootic occurring in and near Glencoe, Baltimore County, Md., from which place reports have been received of the death of many cows with rabiform symptoms.

The method of diagnosis by the detection of Negri bodies in the hippocampus major has been used almost exclusively. Examination of changes in the plexiform ganglia has not been resorted to in a single instance. The inoculation of rabbits has been necessary in fewer

instances than in previous years, and has been employed then only in cases where dogs have inflicted wounds on persons or animals and a satisfactory diagnosis could not be made by the detection of Negri bodies. In cases where the suspect inflicted no injury to man or beast only the examination for Negri bodies was conducted.

During the year there were examined the brains of 152 dogs, 9 cats, 1 goat, 8 cattle, 2 hogs, and 1 horse, a total of 173 cases. Of these there were found to have been affected with rabies 117 dogs, 4 cats, 7 cattle, 1 goat, and 1 horse, a total of 130 cases. Of these positive cases 75 came from the District of Columbia, 25 from Virginia, 21 from Maryland, 3 from West Virginia, 2 from New York, 2 from Kentucky, 1 from New Jersey, and 1 from Tennessee.

SO-CALLED "BLACK TONGUE" OF DOGS.

The bureau has received several reports of the existence of a disease termed "black tongue" among dogs, which appeared to be of an infectious nature and almost invariably fatal. The disease exists principally in the Southern States. Hunting dogs are most frequently affected, and pet animals and common dogs are also susceptible; but it appears that the infection prevails to a greater extent in the fields, woods, or pastures, which explains the greater frequency of the disease among sporting dogs. The symptoms as described in the reports are not of a uniform character, although it is evident that in most instances the predominating manifestations are the lesions in the mouth. The dark discoloration of the tongue appears to be a constant symptom. Other lesions in the mouth may consist of a swelling and reddening of the mucous membrane with erosions and even ulceration. These lesions are most often found around the frenum of the tongue and on the gums and cheeks. The inflammation of the mucous membrane frequently extends to the stomach and intestines, in which the mucous membrane discloses a severe catarrhal inflammation. The affected animals lose strength rapidly and die within a few days from the onset of the disease. Recoveries may occur in exceptional cases.

One form of so-called black tongue has been studied in the laboratories of the Pathological Division. In this instance it affected several animals of a Mexican breed. The symptoms appeared as described above, and a bacteriological examination of the lesions revealed the presence of *Bacillus necrophorus*. A treatment with antiseptic mouth washes and intestinal disinfection appeared to give beneficial results, and thorough and repeated disinfection of the premises prevented the infection among the remaining healthy dogs.

The term "black tongue" as a name for any disease is unfounded, as this simply represents a symptom which may be present in various diseases such as dumb rabies, distemper, Stuttgart disease (typhus canum), necrobacillosis, certain forms of pneumonia, etc. It simply implies a dark discoloration of the mucous membrane of the tongue, which may result from various causes. Thus, for instance, in dumb rabies the dryness of the tongue and the accumulation of dirt on its surface give it the peculiar dark appearance; in other diseases a cyanotic condition may be responsible for the discoloration.

Requests have been made through different sources for material for the further study of the disease existing among the dogs of the South, and it is hoped that it will be possible to discover the nature and successful treatment of the disease.

AUTOPSIES ON WILD ANIMALS.

The National Zoological Park continues to furnish quite an important percentage of the necropsies made by the Pathological Division. During the past fiscal year 114 animals, including mammals, birds, and reptiles, were received from this source. The results of post-mortem examination, as in previous years, show the frequent occurrence of digestive and respiratory disorders, diseased conditions involving these systems outnumbering all other affections combined. While lack of sufficient exercise and unaccustomed climatic conditions are important predisposing factors, the active agents in numerous instances were specifically determined. Mycosis of the lungs as a consequence of aspergillus invasion was particularly destructive to birds, as were also intestinal disorders of protozoan origin. The presence of parasites was not infrequently associated with gastric and intestinal lesions. Of the bacterial diseases, tuberculosis continued to be a menacing factor at the park. Autopsies indicate that monkeys are especially susceptible to this disease.

SKIN DISEASES IN SWINE.

The work at the branch pathological laboratory located at Chicago, Ill., has steadily increased. During the past year a large number of specimens have been forwarded by inspectors located at this and tributary stations for diagnosis.

Two interesting conditions of the skin of swine have been studied. One is that of *nævi pigmentosi*. These *nævi*, or pigmented moles, are congenital and are seen most frequently in black swine, although red and spotted animals are not exempt. They appear as inky black, irregularly round spots, from one-eighth to one-half inch in diameter. In some cases they may be much larger; in such cases they are elevated and are covered with stiff, coarse hair, which grows straight outward. The usual location is in the skin over the back and hams, although they may affect the skin on any part of the body. Usually only a few spots are present, but occasionally an animal is found where they are quite numerous. Inspectors on the killing floors of slaughterhouses report that from 16 to 19 per cent of the hogs are affected. If the small black spots are incised, it will be found that there is a black semifluid pigment deposited between the layers of the skin, while in the larger spots the pigment may extend into the fat beneath.

The other condition is that of *elephantiasis papillomatosa*. In this condition there is a marked hypertrophy of the papillary layer of the skin involving all or part of the surface of the body. The skin of animals so affected is much thickened and very rough, and gives lodgment to sebaceous material and dirt. When the elephantiasis extends all over the body there are deep wrinkles over the head and neck, also on the sides. Animals so affected are called "mangy hogs" by those engaged in buying hogs. So far the etiology has not been determined, but the affection is evidently not of a contagious nature.

BLACKLEG INVESTIGATIONS.

During the fiscal year the Pathological Division has prepared for free distribution over 1,000,000 doses of blackleg vaccine. With the

increased interest that is being manifested in the live-stock industry, as is evidenced by the gradual replacement of the more resistant common range cattle by higher grade stock, the necessity for immunization against this virulent disease appears to be more thoroughly appreciated.

The results of vaccinations for the fiscal year ending June 30, 1910, as reported to the bureau by stock owners who have used the vaccine, are equally as satisfactory as in former years. An examination of the statistics serves to emphasize the degree of immunity that is established by vaccination of the susceptible cattle.

AUTOGENIC VACCINES.

Quite a number of cases of abscess, poll evil, and fistulous withers have been successfully treated with autogenic vaccines made directly from pus germs isolated from the affected animals. The mode of procedure was as follows: Sterile, wide-mouthed bottles were furnished practitioners with instructions to sterilize the exterior surfaces and collect the pus from the last pus that could be expressed from the abscess, or in the case of a closed abscess, to aspirate the pus by means of a sterile hypodermic syringe. This material was then examined microscopically for the presence of staphylococci or streptococci. In some instances the material aspirated from closed abscess proved sterile, and in others there were so few of the germs that it became necessary to incubate the material overnight to cause their multiplication so that good, luxuriant growths could be obtained. Four or five slanted agar tubes were then inseminated thoroughly and incubated two days, in case the predominating forms were streptococci, or one day in case staphylococci were in greater abundance. The growths were then washed down with normal salt solutions and devitalized by heating in a water bath at 55° C. for one hour. The resulting emulsion or suspension of killed bacteria constitutes the vaccine, and is infected subcutaneously, under aseptic precautions, into the root of the neck at its lowest part where the skin is thin and where the resulting reaction can be readily seen. At the same time the ordinary surgical measures, such as dependent openings and drainage, are carried out, as the vaccination treatment should be considered adjunctive only.

It is necessary to know the approximate number of bacteria in the dose of the vaccine, and this is determined by making the vaccine as turbid as a standard tube containing 50,000,000 bacteria per cubic centimeter. An instrument known as a turbidometer has been devised for determining these turbidities.

Two methods of administration were followed, one in which the dose was very small and repeated every four days until six or seven doses had been given, the other in which the dose was very much larger. In the first method of dosage there is little or no reaction from the injections, and the beneficial effects are sometimes delayed. In the second method the reaction is pronounced, consisting of swelling at the site of operation and increase of the discharge from the abscess, it being necessary to wait for several days for the reaction to subside before giving the next dose. On account of this there is little gained in point of time, and moreover the owner is sometimes averse to allowing the treatment to proceed when he sees his animal apparently "made worse," even if only temporarily so.

The first dose given by the slow method—that is, where very small doses are used—is 0.4 cubic centimeter, or 20,000,000 bacteria. The dose is increased by 0.2 cubic centimeter at each dose, so that at the seventh dose the number of bacteria injected is 80,000,000.

The large doses cause a decided temporary drop in resistance of the animal, or a negative phase, which is manifested by depression, increased discharge, and swelling at the point of inoculation. This is succeeded in a few days by increased resistance or increased positive phase. When the smaller doses are given, the short, mild, negative phase is soon succeeded by the positive phase, and thus immunity is built up without the usual depression, etc., to which the owner objects so much. Efforts are now being made to reduce the number of vaccinations to the minimum.

The so-called stock cultures of pus-forming organisms have also been used instead of those freshly isolated from the pus material in order to compare the curative effects, and in nearly every instance the stock cultures fail to give as good results as the more virulent organisms isolated from each case.

INVESTIGATIONS OF POULTRY DISEASES.

Lesions closely resembling those of tuberculosis were discovered about the heads, necks, and wings of some pigeons which had been forwarded to the bureau because of the growth of certain lumps or tumor-like masses in their subcutaneous tissues. These growths developed until they had finally reached the size of chestnuts and were firmly encapsulated. A little pressure after an incision had been made caused the spherical contents of the sac to roll out as a solid ball. A transverse section of this growth showed that it was made up of successive layers of yellowish material. An examination of this material under the microscope revealed the presence in large numbers of acid-fast bacilli which closely simulated avian tubercle bacilli. A closer examination of these rods, however, showed that they were not typical of the acid-fast bacilli usually found in tubercular material from fowls. Pappenheim's test demonstrated that this bacillus was acid-fast only, not acid-alcohol fast. The growths were therefore probably not tubercular.

This "lumpy" disease of pigeons can be developed in other pigeons in about 10 days, whereas genuine tuberculosis of pigeons requires three weeks and more for its development in experimental cases. It therefore appears that this quite common disease of pigeons, usually pronounced tuberculosis on account of having acid-fast bacilli in the cheesy material, must be studied further in order to determine the relationship between this affection and that of avian tuberculosis. A similar disease has been observed about the heads of several Minorca fowls.

THE GERMICIDAL AND KEEPING PROPERTIES OF RAW AND PASTEURIZED MILK.

The germicidal property of raw milk and pasteurized milk was compared by inoculating each kind with a given volume of various kinds of bacteria which could be readily recognized upon agar plates by their pigment or peculiar characteristics of growth. Bacterial counts were made of the raw and pasteurized milk before inoculating

with any organism. The sample of milk was in the majority of cases divided into six lots, three being pasteurized at a given temperature. After the three samples of pasteurized milk cooled to 40° C. six were inoculated with a given organism. One of the raw and one of the pasteurized samples were placed in an incubator at 37° C., one of each at room temperature (25° C.) and one of each in a refrigerator (15° C.). Bacterial counts were made of all the samples at various intervals, to determine which favored most the growth of the inoculated organism. The organisms used for inoculation were *Bacillus prodigiosus*, *B. pyocyaneus*, *B. staphylococcus*, *B. aureus*, and anthrax vaccine.

Comparisons were also made of heated and unheated milk serum and of raw milk serum with horse serum. The keeping qualities of raw milk and of milk pasteurized at various temperatures were compared.

The pasteurization in all instances was done by immersing the samples in water with a thermometer placed in the milk for recording the temperature.

No definite conclusions could be drawn regarding the bactericidal property of raw milk, as the results varied. The raw-milk serum showed no superior bactericidal property over the pasteurized serum. Pasteurization aided in the keeping qualities of milk, depending upon the length of time and the degree of temperature.

THE BIOCHEMIC DIVISION.

The work of the Biochemic Division, of which Dr. M. Dorset is chief, has consisted of laboratory work incident to the meat inspection, laboratory research work relating to meat products, investigations concerning hog cholera, the examination and preparation of stock dips, and the preparation and distribution of tuberculin and mallein.

LABORATORY MEAT INSPECTION.

The laboratory meat inspection is carried out by a central laboratory and six branch laboratories located in as many different cities. At the beginning of the fiscal year a comprehensive plan for the collection and examination of samples, based upon the preceding year's experience, was adopted, and has been followed throughout the year. The result has been to enable the laboratories to do considerably more work, thus rendering the inspection more complete and thorough without increasing the cost.

During the fiscal year the laboratories examined 25,818 samples of all kinds. These examinations included inspection for the presence of prohibited preservatives, prohibited coloring matter, adulterants, and unwholesomeness in meat and meat food products of various kinds, and the examination of salt, spices, condiments, cereals, and other articles used in the preparation of meat food products. They include also the sanitary examination of a large number of different water supplies.

These samples were drawn chiefly from houses at which meat inspection is maintained, and they show that in inspected houses the use of prohibited preservatives and coloring matters is not practiced. In a very small fraction of 1 per cent of all the samples examined prohibited preservatives were found, but this was evidently due to

ignorance or carelessness and not to intentional violation of the regulations on the part of inspected establishments. As in the preceding fiscal year, it was found that the most frequent violation of the regulations consisted in the use of cereal substances in sausages and similar products without proper declaration on the labels, and as a result of giving special attention to this matter considerable improvement was noted toward the end of the fiscal year. Not infrequently lards otherwise apparently pure have been found to give a positive Halphen reaction for cottonseed oil, but in almost every case the amount indicated was extremely small, and it appears from investigations made in the laboratories and hereinafter described that this condition results from the feeding of cottonseed products to hogs before slaughter.

During the year 231 sanitary analyses of water supplies were made. These examinations included a study of the surroundings of each water supply and also a chemical and bacteriological analysis. As a result of these examinations the bureau has ordered the discontinuance of 19 different water supplies which were found to be unsuitable for use on meat food products, and in all cases water supplies of undoubted wholesomeness have been substituted.

Twelve samples involving five alleged violations of the meat-inspection law were examined in the laboratory. The laboratory examinations sustained the findings of the inspector in all cases. The facts were reported to the department solicitor for appropriate action.

During the year 3,560 gallons of branding ink prepared in the Biochemic Division was shipped to inspectors in charge of meat inspection. The total cost of this ink, including materials, labor, and containers for shipment, was \$1,310.

RESEARCH WORK.

The character of the research work carried out in connection with the laboratory inspection of meats has naturally been governed in great part by the questions which have arisen as a result of the routine work. A great number of different problems have received attention. The more important work of this kind is briefly described as follows:

In collaboration with the referee on food adulteration of the Association of Official Agricultural Chemists a number of analyses of samples of lards and other fats were made with the object of determining the most satisfactory means of detecting adulterations of these products. This work has been completed, and the results are in the hands of the referee.

Under the meat-inspection regulations packers are permitted to use seven coal-tar dyes for coloring the outer casings of sausage, provided the color is applied in such a way as not to penetrate the casing. The laboratories have received many samples of proprietary coloring mixtures supposed to consist of two or more of the seven permitted colors. As no method for separating coal-tar colors in mixtures had ever been devised, it was necessary for some procedure of this kind to be worked out in order to determine whether or not mixtures proposed for use on sausage casings were actually composed of the seven permitted colors and no others. Research work by Dr. T. M. Price, in charge of the Washington laboratory, resulted in the development of a

method which appears to be entirely satisfactory, and will, it is believed, be of great value not only to the laboratories of this bureau but also to all others engaged in food-control work. The method is described in Circular 180 of the Bureau of Animal Industry.

The laboratories are frequently called upon by veterinary inspectors to determine the presence of bile pigments in fats from animals which are suspected of being affected with jaundice. The laboratory inspector at East St. Louis, Mr. C. T. Marsh, devised a method by which the bile pigment may be separated from the fats and a positive diagnosis in doubtful cases of jaundice may be made. This work has not yet been published.

Laboratory inspection of lards from certain packing houses showed regularly a positive Halphen test for cottonseed oil, the amount indicated by the test being quite small and therefore impossible of detection by the phytosterol acetate test, even though cottonseed oil had been added to the lard. An investigation of this subject has shown that this cottonseed-oil reaction was due not to adulteration, but to the feeding of hogs on garbage which contained cottonseed products, chiefly cottonseed oil. It is known that large quantities of cottonseed oil are used in salads and for baking and cooking generally, and it is not surprising that the fat of hogs fed on garbage shows a Halphen reaction, as it has been previously known that the feeding of cottonseed meal will produce this result. The work leading to this discovery was carried out by Mr. R. H. Kerr, of the Washington laboratory, and Mr. A. E. Graham, of the San Francisco laboratory.

A bacteriological study of hog carcasses was made with the object of determining whether or not hog cholera bacilli or related organisms belonging to the *Bacillus enteritidis* group were present in the carcasses of hogs which at autopsy showed lesions of hog cholera. The work was carried out at Chicago and Washington, and included a bacteriological study of four classes of hog carcasses, namely, normal carcasses which showed no cholera lesions, carcasses with slight lesions of cholera which had been passed for food, carcasses with more extensive lesions of cholera which had been passed for lard, and carcasses showing extensive lesions of cholera and which had been condemned for offal. The carcasses in the second, third, and fourth groups corresponded to those specified in paragraphs 1, 2, and 3 of section 10, regulation 13, of the meat-inspection regulations (Bureau of Animal Industry Order 150), and were obtained from packing houses in the course of routine inspection. Cultures were taken from practically all parts of the carcass, including the liver, spleen, kidneys, lymphatic glands, heart muscle, and voluntary muscle.

The results of this investigation showed that organisms of the colon-typhoid group were almost constantly present in the livers of normal hogs, but seldom in the other tissues. In the case of hogs affected with hog cholera, colon-typhoid organisms were not only present in the liver, but were quite generally distributed through the other tissues as well. There appeared to be little, if any, difference in the occurrence and distribution of colon-typhoid organisms in the three classes of cholera hogs studied—that is, colon-typhoid organisms were present as frequently in the organs and tissues of carcasses showing slight cholera lesions as in the carcasses showing extensive cholera lesions. No organisms of the *Bacillus enteritidis* or so-called hog cholera group were found. The organisms referred to as belonging to the colon-typhoid group presented the usual characters of the

colon bacillus, some strains fermenting glucose, lactose, and saccharose, and some only glucose and lactose. There were also organisms which corresponded with the classical description of *Bacillus fecalis alkaligenes*. No organisms corresponding to the typhoid bacillus were found.

Some packing houses have experienced difficulty in preparing the product known as "sausage in oil" so that it would keep well after being taken out of the refrigerator. An investigation was undertaken with the object of improving, if possible, the methods of manufacture. The study showed that sausage in oil as found in the market in unopened cans is never sterile, organisms of the subtilis group being constantly present and occasionally also organisms of the colon-typhoid and proteus groups. Eighteen packing establishments were visited by Dr. McBryde, of this division, and the methods of processing and handling this product were observed. In no case was the inside temperature of the cans raised sufficiently high in processing to insure the sterility of the product. Experiments were carried out at different plants to determine how high the cans could be heated without injury to the product, and also to determine the effect of this heating on the bacteria which exist in the sausage when it is packed. These experiments showed that temperatures above 195° F. usually injure the casings of this sausage to such an extent that its market value is seriously impaired. Under these conditions it is manifestly impossible to destroy the very resistant spores of *Bacillus subtilis* in the sausage after it has been packed, as a much higher temperature than 195° F. would be required. This temperature, however, would be sufficient to destroy the nonspore-bearing organisms of the colon-typhoid and proteus groups.

As a result of practical tests and laboratory study, recommendations were made that all cans of sausage in oil be heated sufficiently high to insure an inside temperature of 160° F., and that this temperature be maintained for at least one-half hour. It seems not unlikely that the spores of *Bacillus subtilis* are chiefly introduced through the cereals added to the sausage, and experiments are being carried out to determine whether these organisms may be destroyed by heating the cereals before they are added to the sausage.

Recent investigations at establishments under inspection have revealed the presence of foreign material in the livers of swine. Such livers are characterized by slightly raised, light-brownish areas which give to the organs a somewhat mottled appearance. These areas do not resemble a parasitic condition, but are quite characteristic and may be readily recognized. When cut across the affected area the livers show a lighter color than the normal liver tissue, and this condition is more noticeable around the hepatic veins. These livers frequently contain hair, and in some instances bristles are found protruding from the smaller branches of the hepatic veins. Frequently these hairs are attached to rounded plugs of fat or to masses of chocolate-brown material. The plugs of fat are particles of tissue from the sticker's wound in the neck which are driven into the vessels by the beaters in the dehairing machine. The chocolate-brown material represents discolored blood clots which result from the action of the hot wash water on the blood of the veins. In some establishments a large percentage of the hog livers show the condition above described.

The presence of this foreign material is noted where a certain type of dehairing machine is used and the hogs pass through it head up. The hair and dirty wash water enter the sticker's wound and gain entrance to the liver through the heart and posterior vena cava. The objectionable condition can be overcome by requiring that the hogs pass through this type of machine head down and that the practice of pumping back dirty wash water and applying it to carcasses be discontinued. This finding has resulted in an order directing that all livers contaminated in the manner indicated above be condemned.

The study of the effect of prolonged storage on canned meats has been continued. During the past year a careful chemical, histological, and bacteriological study has been made of the different classes of canned meats in storage, and the remainder of the samples are being held for later examination. A part will be examined during the coming fiscal year and others will be stored for a still longer time. The results so far are not of sufficient importance nor are they sufficiently well substantiated to warrant a detailed report.

In addition to the lines of work reported above, a considerable amount of time has been given to the consideration of the questions of less importance, such as the solubility of paraffin and sulphur in lard, the production of formaldehyde by heating concentrated cane sugar solution, the suitability of silicate and shellac as protective coverings for galvanized containers, and a study of the constituents of meat extracts and of extracts made from organs with a view to identifying these either alone or in mixture. A refrigerating machine was installed and a few cold-storage rooms were constructed preliminary to study of the effect of cold storage on meats.

DIPS AND DISINFECTANTS.

It was stated in last year's report that a formula had been evolved for a concentrated arsenical dip for tick-eradication work and that the preparation was undergoing practical tests in the field. The results of these tests were satisfactory, and as a consequence the preparation of this dip for limited use by bureau employees in the field has become a part of the routine work of the laboratory. Thus far a sufficient amount of this dip has been sent out to make over 30,000 gallons of diluted dipping bath.

The arsenical dip employed for cattle has been the subject of some study throughout the year along such lines as a search for formulas which will afford a concentrated dip, the best method for obtaining a good tar emulsion, the applicability of hard waters for preparing the dip, and certain precautions necessary for obtaining complete solution of arsenic. The work has enabled the laboratory to make some suggestions of value in the preparation of such dips.

As a result of the analysis of certain samples of arsenical baths in which cattle had been dipped, it was discovered that under certain conditions arsenious solutions prepared by boiling arsenious oxid with sodium carbonate are subject to oxidation, so that after several weeks nearly all the arsenic is to be found in the form of salts of arsenic acid. The cause of the change appears attributable to bacterial activity. An account of the work done in studying the change and in tracing its cause has been prepared for publication.

For a number of reasons it appears desirable that the bureau should have knowledge of the degree of absorption or retention of arsenic

by the various tissues of cattle dipped in arsenical solutions, such as are at present in use for combating the Texas fever cattle tick. Experiments intended to obtain the desired information are already under way, the work being carried out in collaboration with the Zoological Division.

During the year there was developed a method for the determination of nicotin in nicotin solutions and tobacco extracts, which seems to offer decided advantages over methods previously available. An account of this work and a description of the method have been published as Bureau of Animal Industry Bulletin 133.

For more than two years dimethyl sulphate has been employed in this laboratory as a reagent for testing creosote oils and dips prepared therefrom. The test has proved of such value that a description of it has been published as Bureau of Animal Industry Circular 107.

An investigation into the effect upon the composition of coal-tar creosote baths caused by the passage of sheep through such baths has been continued from the previous year. It was proved that as dipping is continued the percentage of cresylic acid contained in such baths becomes progressively less. It is probable, therefore, that as sheep pass through such baths their wool to a certain extent plays the part of a strainer and mechanically remove from the emulsion an undue proportion of globules of oil and cresylic acid.

Examination of samples of dips, disinfectants, and related materials submitted by manufacturers, bureau inspectors, the general supply committee for the Executive Departments and by other Government offices, has been continued as in the past with no new developments worthy of note.

Through General Order 143 the Secretary of Agriculture created the Insecticide and Fungicide Board to assist him in the enforcement of the insecticide act of 1910. The chief of the Biochemic Division was made chairman of the board, and the Secretary directed that a certain part of the work which naturally fell within the province of the Bureau of Animal Industry should be carried out by this bureau. The laboratory work, which has necessitated the assignment of two bureau employees to this work exclusively, has so far consisted in the examination of certain classes of samples.

TUBERCULIN AND MALLEIN.

The amount of tuberculin furnished to State, county, and municipal officials in various States and Territories for diagnosing tuberculosis in cattle continues to increase. During the past year there was distributed a total of 422,043 doses, this being an increase of approximately 20 per cent over the previous fiscal year.

As all officials who receive tuberculin from this bureau are required to report the results of the tests made by them, a large number of records have collected during the years that tuberculin has been distributed. During the past year it has been possible to go over a portion of these records, and some interesting data have been secured. It is evident that in determining the reliability of the tuberculin it is possible to utilize only such records as show the results of autopsy on the tested animals. Excluding all tests which were defective in any respect, we have been able to secure temperature charts of 8,980 tuberculin tests on cattle that were afterwards slaughtered. In going over these charts the tuberculin reaction has been regarded as

positive when the maximum temperature after injection was at least 103.8° F., provided this maximum represented a rise of at least 2° F. above the maximum temperature recorded before injection. In applying this rule to the 8,980 slaughtered cattle it has been found that 550 failed to react, while 8,430 gave a positive reaction. Of the animals which gave a positive reaction, 8,358, or 99.15 per cent, showed lesions of tuberculosis at autopsy. This is considered a remarkably high percentage of accuracy, in view of the fact that this tuberculin was used in general practice in all parts of the country and by a large number of different veterinarians. From these figures, even if unsupported by other evidence, it would appear to be evident that a positive tuberculin reaction is a practically unfailing indication of tuberculosis in the animals tested.

Up to the present time there has been no satisfactory means of standardizing tuberculin. Such a process is highly desirable, for it has been shown that at times there have been placed on the market tuberculins which were lacking in potency. A study of this subject is now under way in the Biochemic Division.

During the fiscal year 91,642 doses of mallein for the diagnosis of glanders in horses were sent out to public officers. This represents an increase of approximately 25 per cent as compared with the preceding year.

HOG CHOLERA.

In my last report it was stated that considerable time had been devoted to demonstration work in connection with the production of serum for the prevention of hog cholera, the objects of this work being to demonstrate successfully the value of the serum and thereby to encourage State officials to take up the manufacture of serum for the benefit of farmers, as it was not practicable for the Bureau of Animal Industry to undertake a general distribution to individuals. It now appears that this work has been productive of much good, as 21 States, including practically all of those in which hog raising is an important industry, have made provision for serum production, and not less than 200,000 inoculations have already been made by State officials. The results reported have been extremely favorable, and while the number of hogs treated is not large when compared with the total number in the United States, sufficient has been done to show that the State officials and the farmers are interested, and it is believed that with further development of the work a great deal of good will be accomplished.

A demonstration experiment carried out at the Kansas City Stock Yards was described in my last report. During the past year a similar experiment was carried out at South Omaha, Nebr. This experiment was undertaken at the request of State officials and the Nebraska Swine Breeders' Association. The Union Stock Yards Company of South Omaha also offered to cooperate and to bear the expense incident to the purchase and care of the hogs used in the experiment. Thirty pigs weighing from 40 to 60 pounds were purchased from a farm which had been free from hog cholera for several years. These hogs were carried to the stockyards, and on July 23, 1910, four of them were injected with blood from hogs sick of hog cholera. These injected pigs, which were placed in a pen by themselves, became sick on the 28th of July, at which time 18 of the remaining pigs were given one dose of the serum, while the other 8 pigs were

not treated in any way. The 18 serum-treated pigs and the 8 untreated pigs were then placed in the same pen with the 4 pigs which had been made sick of hog cholera. The 4 pigs which were inoculated with hog cholera all died. The 8 untreated check pigs all contracted hog cholera from the 4 inoculated ones. The 18 pigs which were given serum and which were confined in the same pen with the 4 original sick pigs and with the 8 untreated pigs which became sick remained perfectly well and were finally turned over to the officials of the stockyards company upon the completion of the experiment on September 17, 1910. The experiment was witnessed by representatives of the Nebraska Agricultural Experiment Station at Lincoln and of the Nebraska Swine Breeders' Association, as well as by representatives of several different agricultural papers published in Nebraska.

The use of carbolized or phenolized blood, as described in my last annual report, has been continued during the year. The later results confirm the earlier observations in showing that the virus of hog cholera may remain in contact with comparatively strong solutions of phenol for weeks without noticeable impairment of its virulence. There seems to be little doubt that phenolized blood will gradually come into general use in connection with the "simultaneous method," as the presence of the phenol prevents the development of putrefactive bacteria and does not destroy the virus of hog cholera. This will enable practitioners to keep virus on hand for a reasonable length of time.

Considerable study has been given to the effect of different preservative agents on the virus of hog cholera as contained in the blood of sick hogs. In addition to the continued study of phenol much attention has been devoted to thymol and formaldehyde. The results with regard to these, however, are not yet complete. Aside from the desirability of having some means of preserving the virus for use in simultaneous inoculations, it is also desirable to have some means of preserving disease-producing blood which is to be used later for hyperimmunization. Phenol is not satisfactory for this purpose, but it is hoped that some efficient germicide which is efficient against ordinary bacteria, but which does not materially affect the virus of hog cholera, will be found suitable for this purpose. Some attention has also been given to different preservatives for serum. These observations are not yet complete.

The study of the immunity possessed by young pigs has been continued, but up to the present time the data obtained are not sufficiently conclusive to warrant a definite statement of results.

WORK FOR THE COMING YEAR.

During the ensuing fiscal year it is proposed to make a study of the changes taking place in meat during cold storage, the object being to decide upon the best conditions of storage and to ascertain whether or not meat becomes unwholesome after storing for a long time.

A study of the egg breaking and packing industries has also been undertaken and is in charge of a committee consisting of the chiefs of the Pathological, Animal Husbandry, and Biochemic Divisions. Plans have been made for carrying on this investigation in cooperation with a similar organization in the Bureau of Chemistry.

Other lines of investigation mentioned in this report will be continued, special attention being given to an investigation of the cereal and water in sausage and to methods for the standardization of tuberculin.

THE ZOOLOGICAL DIVISION.

The Zoological Division, under Dr. B. H. Ransom, chief, has been engaged, as heretofore, in the investigation of parasitic diseases of animals and in the study, collection, and determination of animal parasites.

ROUNDWORMS OF SHEEP.

The investigations relative to stomach worms and other roundworms parasitic in sheep have been continued. Experiments not yet completed are in progress which are intended to give data on the reduction and prevention of parasitic infection by rotation of pastures.

It has been found that the embryos of the hair lungworms of sheep pass out of the body of infested animals with the feces, and it is probable that infection is spread as commonly through this means as through the sputum.

Important facts have been determined bearing upon the life history of the gullet worm of sheep and cattle.

TAPEWORMS OF SHEEP.

Investigations have been begun relative to the fringed tapeworm, which in the western United States apparently does more damage than any other internal parasite of sheep, the stomach worm and the nodular worm being as yet rare and of little importance in the Rocky Mountain and Plains regions.

GID IN SHEEP.

It has been definitely determined by experiment that the tapeworm stage of the gid parasite will develop in coyotes. The coyote is therefore a factor in the spread of this disease as well as the dog. Except for a center of infection in the State of New York, the disease still appears to be enzootic in this country only in Montana. Two publications relative to gid have been issued during the year, one (Bulletin 125) rather technical in character, the other (Circular 165) of a more popular nature.

Gid apparently was introduced into New York through infested sheep dogs imported from Europe, and it was on account of the danger of further occurrences of this kind that B. A. I. Order 176 of November 25, 1910, was issued, providing for the quarantine and inspection of imported sheep dogs.

To determine the presence or absence of tapeworm infection, fecal examinations were made of 52 imported dogs quarantined under the provisions of Order 176. Eighteen of these dogs were found to be infected with tapeworms and received appropriate treatment before they were released from quarantine. The total number of fecal specimens examined, including those taken subsequent to treatment to determine the success of the treatment, was 80. In several instances

repeated treatments were necessary before the tapeworm eggs disappeared from the feces. The quarantine and treatment were conducted under the supervision of the Quarantine Division.

SHEEP SCAB.

The favorable results obtained in the experiments with tobacco dip without sulphur, in cooperation with the Kentucky Agricultural Experiment Station, have been confirmed by the reports of practical dippings in the field by bureau inspectors. Dipping solutions containing 0.07 per cent of nicotin were used. Reports have been received relative to the dipping of 20 lots of sheep infected with scab, comprising 35,515 head, and 1 lot of exposed sheep, comprising 2,950 head. Four of the lots were reported as not exposed to reinfection after dipping, 11 were returned to infected range or pasture, and it was not known in the case of 6 lots whether they were exposed or not. The disease was reported cured in all cases, with no reappearance as determined by inspections made after a lapse of time varying from 1 to 6 months in different instances.

As a result of these investigations the use of tobacco dips without sulphur has been permitted in the official dipping of sheep for scabies.

CATTLE MANGE.

Under the supervision of Dr. W. E. Howe, of this bureau, further experiments in the treatment of cattle mange with a kerosene and soap preparation have been carried out.

On April 14 two lots of mangy cattle (11 and 15 respectively) were treated in a spraying machine with the preparation diluted to give a strength of 8 per cent of kerosene. Five weeks after spraying mites were found in 2 cattle of the first lot and 6 cattle of the second lot.

On April 15 two lots of mangy cattle (11 and 13) were treated in a spraying machine with the preparation diluted to give a strength of 7 per cent of kerosene. Five weeks after treatment mites were found on 2 animals in each lot.

On April 18 two lots of mangy cattle, of 15 each, were dipped in the preparation diluted to give a strength of 7 per cent. Five weeks after treatment mites were found on 1 animal in each lot.

Two lots of mangy cattle (14 and 15) were dipped April 19 and 20, respectively, in the preparation diluted to give a strength of 6 per cent. Five weeks after treatment one lot was apparently free from mange; in the other lot 2 animals were found to be infected.

From these experiments it may be concluded that the kerosene preparation in question is not efficacious in the treatment of cattle mange when used as a dip in a strength of 7 per cent or less or as a spray in a strength of 8 per cent or less, a single application of the remedy being given in either case, even though it is used in the spring of the year, at which time mangy cattle tend to improve in condition without treatment.

INVESTIGATIONS RELATIVE TO TICK ERADICATION.

Bulletin 130, recording the results of two years' investigations relative to the life history of the cattle tick and other points bearing on tick eradication, which were conducted in cooperation with the

veterinary department of the Alabama Polytechnic Institute, was issued during the year.

In experiments with arsenical dips it was found that no appreciable ill effects were produced on calves dipped during the period from the latter part of June to the latter part of October, repeated at intervals of two and three weeks in a dip composed of 10 pounds of arsenic trioxid, 25 pounds of sodium carbonate, 1 gallon of pine tar, and 500 gallons of water.

Two series of experiments were conducted with a proprietary arsenical dip, one during the summer in southern Texas, the other during the fall in Oklahoma. The dip proved efficacious in destroying ticks when applied twice with an interval of 10 days between dipplings and at a dilution which gave an equivalent of 0.22 per cent arsenic trioxid in the dipping bath.

Experiments on a small scale with an arsenical dip prepared in concentrated form by the Biochemic Division were sufficiently favorable to warrant field trials of the preparation.

In all of the experimental work with dips, the Biochemic Division has cooperated in devising improvements in the preparation of the dips and in supplying analyses of the dips used.

Investigations have been begun in cooperation with the Biochemic Division relative to the absorption of arsenic through the skin of cattle dipped in arsenical dips and the effect of such absorption upon cattle and upon subsequent tick infestation.

INVESTIGATIONS CONCERNING PARASITIC PROTOZOA.

Further work has been done upon a trypanosome common in the blood of American cattle, but apparently nonpathogenic, and a bulletin recording this work has been prepared for publication.

Interesting and important facts have been determined relative to certain morphological details in the Sarcosporidia.

Fortunately for the live-stock industry of the United States, no exotic trypanosome disease has succeeded in becoming established in this country, although animals as stock and for menageries have been brought here in the past more or less indiscriminately from all parts of the world. Past good fortune, however, does not necessarily promise immunity for the future. As illustrations, it may be noted that importation of animals from Europe went on for several hundred years before that highly injurious pest of live stock, the horn fly, became established (since 1886) in this country, and that dourine was brought in only a few years ago, the first outbreak causing considerable damage before the disease was eradicated. It is therefore highly important that all possible practicable precautions should be taken to guard against the ever imminent danger of introducing trypanosome diseases with shipments of animals from abroad, especially in view of the fact that these diseases, as a rule (dourine being as exception), are transmitted by winged insects and hence are almost impossible to eradicate if they become established. In order to supply information relative to trypanosomes, in a readily available form, a paper is in preparation, and nearing completion, in which are given the diagnostic characters, life history, host animals, and geographic distribution of all known species of trypanosomes.

INDEX-CATALOGUE OF MEDICAL VETERINARY ZOOLOGY.

The author index of this catalogue has been completed, parts 27 to 34 having been issued during the year, and part 35 having since appeared. Part 36, containing additions and corrections, has been prepared and sent to the printer. In reporting the completion of this index it may be noted that this is one of the most important and valuable reference works on the subject of parasitology ever published and has been greatly in demand not only in this country but also abroad.

PARASITES OF HOGS.

Some work has been done on the kidney worm, stomach worms, and ascarids of hogs. More extensive investigations of these important parasites are contemplated for the ensuing year.

MISCELLANEOUS.

Numerous autopsies were performed on various animals, wild and domesticated, and examinations made for the presence of parasites; a large number of specimens sent in by the field force of the bureau and by other correspondents were examined and identified; the usual amount of correspondence relative to parasitic diseases was received and replied to, and other routine matters have received attention.

An important work on the nematodes parasitic in the alimentary tract of cattle, sheep, and other ruminants, which has been in preparation for several years, has been published as Bulletin 127.

Several new species of parasites discovered in the course of investigations carried on in this division have been described and the descriptions turned over to the United States National Museum for publication.

THE EXPERIMENT STATION.

The work at the bureau's Experiment Station at Bethesda, Md., under Dr. E. C. Schroeder, superintendent, during the past fiscal year has been of the same general character as in former years, consisting of independent investigations, investigations in cooperation with other divisions of the bureau, and the provision of facilities for the other divisions to make investigations of a kind that require farm and field conditions not obtainable within the limits of the city. During the year most of the work in animal husbandry was transferred to the newly purchased farm at Beltsville, Md., and it is proposed henceforth to confine the work at Bethesda mainly to investigations of animal diseases.

TUBERCULOSIS INVESTIGATIONS.

Tuberculosis was the subject of the more important investigations of the year. Studies relative to the protective treatment of cattle against this disease have been continued, and, while nothing radically new has been discovered, the results obtained with various methods of bovo-vaccination against tuberculosis are encouraging. No treatment that will give cattle a practically valuable immunity against tuberculosis without the inoculation of living tubercle bacilli has yielded promising results, and there seems to be no reason for changing the formerly expressed view that the time has not yet come to jus-

tify the wholesale injection of cattle with living tubercle bacilli for purely economic purposes, even if the bacilli used are only weakly pathogenic in character.

Some studies have been made on small experiment animals relative to the latency of tubercle bacilli in the tissues of living animals. That tubercle bacilli may enter and remain latent in the bodies of animals for considerable periods of time, and afterwards, for some reasons not well understood, become active and cause tuberculosis, is a belief held by many competent investigators. If this belief should prove true it will have a very important bearing on all measures for the eradication of the disease. The bureau's investigations have not progressed far enough to warrant any conclusions.

As there are many tuberculous cows from which milk is used as food for persons and lower animals, and as the use of properly pasteurized milk from tuberculous cows is generally regarded as safe, an experiment was made to throw more light on this subject. It seemed especially desirable to learn whether the ingestion of milk that contains tubercle bacilli killed by pasteurization will cause either an increased or reduced susceptibility to infection with living tubercle bacilli. As far as this work has gone it indicates that dead tubercle bacilli ingested with pasteurized milk have no harmful effects on guinea pigs, but that living tubercle bacilli ingested with milk, even when they cause no disease, increase the rapidity with which guinea pigs die from subsequent inoculation with tubercle bacilli.

The question of the relative value of raw, pasteurized, and boiled milk as food for young animals has received some attention, but it is too early to report on this work, beyond stating that it clearly shows that the artificial feeding of unweaned animals with milk of an alien species is by no means conducive to their best development, and when small, delicate animals, such as guinea pigs, are used the mortality is very high.

Further investigations relative to the sources from which hogs contract tuberculosis, as far as such investigations are possible at the station, show that the exposure of hogs to the feces of tuberculous cattle is a much more certain cause of their infection than their exposure to milk from tuberculous cows or to hogs affected with tuberculosis. It must not be concluded from this, however, that raw milk from tuberculous cows is a safe food for hogs or that the presence of tuberculous hogs in a hog yard is without serious danger.

A number of samples of commercial tuberculin were tested to determine whether they were of sufficient potency to be reliable for use as diagnostic agents for cattle tuberculosis. It is pleasing to be able to report that all the samples tested were found to be satisfactory.

A number of tests of the different ways in which different preparations of tuberculin can be applied for diagnostic purposes have been made. These tests prove that the subcutaneous injection of ordinary old tuberculin is by far the most reliable manner in which tuberculin can be used as a diagnostic agent for cattle tuberculosis. Other methods of application as yet hold out no real promise that they may have value as a means for controlling those fraudulent practices which are used by dishonest persons to defeat the power of a subcutaneous injection of tuberculin to cause a reaction in the presence of tuberculosis.

An experiment relative to the derivation of a healthy from a tuberculous herd of cattle is still in progress.

Considerable work has been done with a bacterium which, as far as we are able to determine, has not been described before. The germ is of common occurrence in the samples of commercial milk examined at the station, and there are several cows at the station which secrete it with their milk. It was found to be present in the milk of approximately 10 per cent of a herd of about 150 dairy cows located in the District of Columbia. It reaches the milk of apparently healthy cows before the milk leaves their udders, and it causes in guinea pigs a serious chronic disease, at times closely resembling tuberculosis in its gross pathologic appearance. This bacterium, from our present viewpoint, seems to have been overlooked in the past because it does not grow on ordinary culture media and because it is very chronic in its pathogenic action on guinea pigs, which animals it affects both through inoculation and ingestion. It is a very minute, Gram-positive, nonacid-fast bacillus. We have cultivated it artificially and have not only proven that pure cultures produce its characteristic pathologic lesions in guinea pigs, but have recovered it from the tissues of guinea pigs infected with pure cultures.

Two conditions evidently due to the bacillus are specially noteworthy. One is that it occasionally causes paralysis in guinea pigs, and the other that it at times causes a peculiar disease in or about the bone articulations. Neither the paralysis nor the disease of the articulations has been observed in any of the large number of guinea pigs at the station which have not been infected with the bacillus. The joint disease is particularly interesting because bacteriologically it is associated with a micrococcus, thus foreshadowing the possibility of a microorganism which by itself may be harmless but which in the presence of another microorganism may cause disease of the bones or their articulations. The importance of this bacterium remains an unsolved question which will receive careful attention in the future. Just at present it is important because it proves conclusively that germs, pathogenic for guinea pigs and possibly for other animals, derived directly from the udders of milk cows, which no system of inspection applied to dairy herds, barns, milk utensils, etc., can eliminate, and which an ordinary bacteriological examination of milk would fail to detect, are of fairly common occurrence in milk. The thermal death point of the bacillus is 60° C. (140° F.) maintained 15 minutes.

OTHER WORK.

During the fiscal year facilities were provided at the Experiment Station for the various divisions of the bureau to aid them in their investigations concerning tetanus, John's disease, glanders, swamp fever, dourine, blackleg, infectious abortion, lip-and-leg ulceration, sarcoma, hog cholera, caseous lymphadenitis, ringworm, rabies, diamond skin disease, bighead of sheep, Texas fever and cattle ticks, intestinal parasites of sheep, gid, dips for removing external parasites, inbreeding, studies in Mendelian laws of inheritance, selective breeding, the possible effects of inbreeding on susceptibility of disease, etc.

FUTURE WORK.

Besides continuing unfinished work, the following lines of research are contemplated during the coming year and following years: To repeat tests made a few years ago regarding the frequency with which tubercle bacilli occur in butter; to learn if possible whether American oleomargarin (like European, according to European investigators) contains tubercle bacilli in a fairly large percentage of instances; to make additional tests to determine the frequency with which dairy cows eliminate from their bodies the newly discovered bacillus already mentioned; to make additional tests relative to the frequency with which this bacillus occurs in commercial milk; to make additional tests relative to the significance of this bacillus, especially when it occurs in symbiosis with certain other bacilli, and to determine if possible whether the bacillus is associated with some definable condition in the bodies of the cows that eliminate it. It is also desirable to make further tests relative to the persistence of tubercle bacilli in a virulent state in manure heaps from stables containing tuberculous cattle. Some work on the subject was done during the past year, but we were not able to carry it out in a way to obtain satisfactory material for reliable conclusions.

REPORT OF THE CHIEF OF THE BUREAU OF PLANT INDUSTRY.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
Washington, D. C., September 30, 1911.

SIR: I have the honor to submit herewith a report of the work of the Bureau of Plant Industry for the fiscal year ended June 30, 1911.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

GENERAL WORK OF THE YEAR.

The total funds appropriated by Congress for the work of the Bureau of Plant Industry for the fiscal year ended June 30, 1911, were \$1,758,206, of which \$255,270 was for statutory salaries, and \$309,590 for the work in connection with the purchase and distribution of seeds, while the remainder, \$1,193,346, was apportioned in definite items among the various branches of the bureau conducting scientific or related work.

BUSINESS OPERATIONS.

The volume of correspondence of the bureau during the past year entailed the preparation of replies to about 300,000 letters, covering a wide field of agricultural activity. This number is exclusive of many general inquiries received by the bureau which can be answered through the sending of circular letters or publications.

In connection with the fiscal operations of the bureau, 6,300 requisitions for supplies were issued; 15,700 accounts were received and audited administratively; 176 requests for contracts and leases were made; 1,628 letters of authorization and amendments thereto were drawn; and 1,888 letters of instruction to field investigators were prepared.

CHANGES IN PERSONNEL.

During the year a number of changes have taken place in the personnel of the bureau. On January 1, 1911, Mr. G. Harold Powell, the assistant chief of the bureau, resigned to accept the position of secretary and manager of the California Citrus Protective League.

Mr. William A. Taylor was made assistant chief in the place made vacant by the resignation of Mr. Powell. Owing to the large amount and constant growth of the administrative work, Dr. Nathan A. Cobb has been designated as acting assistant chief to aid the chief and assistant chief of the bureau in their work.

A change was made necessary in the Office of Grain Standardization by the resignation of Mr. John D. Shanahan. Dr. J. W. T. Duvel was placed in charge, as set forth in another part of this report.

The Farmers' Cooperative Demonstration Work and the field studies in beet-sugar production suffered the loss of the men in charge through the deaths of Dr. S. A. Knapp and Mr. Charles F. Saylor. Mr. Bradford Knapp was appointed to take charge of the Farmers' Cooperative Demonstration Work and the studies of sugar-beet production formerly conducted by Mr. Saylor have been merged with other projects on sugar beets in charge of Mr. W. A. Orton.

From September 1, 1910, to August 31, 1911, the following changes in the personnel of the bureau were made: Resignations, 226; deaths, 7; dismissals, 2; transfers from the bureau, 35; and furloughs and terminations of appointments, 435; making a total of 705 employees dropped from the rolls during that period. There have been made in the same period 1,007 appointments, increasing the total force of the bureau by 302. On September 1, 1911, the numerical strength of the bureau was as follows: In Washington, 686; outside of Washington, 1,096; total, 1,782. The total number of employees in the bureau on the same date a year ago was 1,480.

PUBLICATIONS.

The publications and the job printing work of the bureau have continued in charge of Mr. J. E. Rockwell.

The number of new publications issued during the year was 97, the first editions aggregating 1,596,900 copies. In addition, 7 papers were contributed to the Yearbook of the department for 1910, all of which will be reprinted in due course in separate form for special distribution. The 97 publications mentioned contain 3,588 printed pages, 177 full-page plates, and 559 text figures. The total number of pages of printed text exceeded that of the previous fiscal year by 934, while the plate and text-figure illustrations used were greater by 18 and 197, respectively.

The new publications issued include 34 bulletins of the bureau, 23 numbered circulars of the bureau, and 23 Farmers' Bulletins.

The number of publications, exclusive of Farmers' Bulletins, reprinted during the year was 76.

FIELD STATIONS.

It has been found necessary for the bureau to maintain a number of field stations in order to successfully prosecute the numerous and varied lines of work required. The propagation and testing of new plant introductions; the securing of information regarding the best methods of harvesting, handling, storing, and shipping grains, fruits, and other crops; the testing of seeds used by the farmer and gardener; investigations, experiments, and demonstrations to determine the underlying principles governing agriculture in the Great Plains area; and investigations, experiments, and demonstrations for the guidance

of farmers, fruit growers, and others taking up land in connection with the reclamation work are some of the projects requiring the department to acquire the use of land and to maintain on such lands certain public improvements.

Some of these lines of investigations are of such a nature as to require their continuance without interruption or material modification through a long term of years and, under a plan of coordination of the work at many stations located in different States, it is believed that it will eventually be found practicable to secure this permanency entirely through cooperation with the State experiment stations, such as is now in effect at most of the places where investigations of this nature are being carried on. The policy of the bureau is, therefore, to recognize that in the establishment and management of these field stations it is assuming a more or less temporary responsibility which ultimately will be transferred to the experiment stations as the proper agents for the permanent holding of lands and improvements within the State where they are located. The policy, furthermore, is to develop as rapidly as possible a thoroughly coordinated system of cooperation between the department and groups of State experiment stations for the investigation of problems of such character as can not be successfully solved by the several stations working independently of each other and of the department.

It is highly important, however, that the bureau shall have authority to take care of its men and its work at these stations by furnishing proper temporary buildings and by erecting fences and structures for stock and machinery whenever necessary, and as the cooperative work with the State experiment stations develops to transfer such improvements to the State station or to dispose of them by the usual process of law.

LABORATORY OF PLANT PATHOLOGY.

Studies have been continued under the direction of Dr. Erwin F. Smith on the various diseases of plants under investigation with very good results, some special lines of work having been completed and reported upon in bulletin form. Chief among the latter may be mentioned the following:

CROWN-GALL OF PLANTS.—The greater effort of the laboratory during the entire year has been centered upon crown-gall of plants. A full report in bulletin form was published, giving the life history and cultural characters of the causal organism; pointing out the difficulties attending its isolation and identification during the seven years of study devoted to the disease; its wide range of host plants; numerous illustrations showing the nature of the tumors produced, time of their production, etc. The striking similarity of crown-gall of plants to certain malignant animal tumors was also pointed out. Later, in a circular, this phase was taken up in detail, several new facts being brought out, and an additional bulletin will soon be ready for publication to fully illustrate the interesting results obtained in connection with this study.

TUMOR DISEASE OF LIMES AND OTHER CITRUS FRUITS.—Further study with excellent results has been made on the destructive tumor disease of citrus fruits. The bulletin which was ready for publication last

year, as mentioned, was withheld awaiting these results, which have now been incorporated therein, and the report is soon to be published.

SPOT DISEASE OF CAULIFLOWER.—A bulletin has been prepared and published on the new disease of cauliflower, giving a biological study of the parasite involved and the results of experiments carried on to determine the conditions under which infection takes place, etc.

BUD-ROT OF THE COCONUT PALM.—A bulletin has been prepared and is now in the hands of the printer, giving in detail the results of the experiments carried on for several years on the bud-rot of the coconut palm. The cause of the disease has been determined, and many experiments have been made with a view to its prevention and eradication.

COOPERATIVE STUDIES OF PLANT DISEASES.—Work on the very destructive blight of the banana has been continued. A new wilt disease of the belladonna and a blight of the poppy have been discovered. Considerable work has been done on both these diseases, and the cause of the belladonna wilt has probably been made out. Studies have been continued also on the bacterial and fungous content of spoiled corn, the biochemical side of the question being investigated in cooperation with the Laboratory of Drug and Poisonous Plant Investigations. Work for the coming year will be continued along the same general lines.

PATHOLOGICAL COLLECTIONS AND INSPECTION WORK.

ADDITIONS TO THE COLLECTIONS.—During the past year many species of great economic interest have been acquired by purchase of foreign and American sets of exsiccata. Among these acquisitions were several rare old sets which are valuable in questions of synonymy or identity, and especially important in guarding against the introduction of diseases not occurring in this country. Many species were also added by means of the mycological exchange and by miscellaneous identifications for collaborators, agriculturists, correspondents, and others. Pure-culture specimens to the extent of about 200 were purchased and are kept alive for use in experimental or demonstration work. The work of indexing new fungi and diseases has been continued and supplemented by the translation of technical diagnoses of new species or diseases, with copies of drawings and photographs when possible.

INSPECTION WORK.—The inspection work done for the offices of Seed and Plant Introduction and Distribution, Congressional Seed Distribution, and Crop Physiology has included the examination of many thousands of species. Generally the importations or exportations were healthy, but certain consignments found affected with new or dangerous diseases were condemned or held for treatment.

FRUIT-DISEASE INVESTIGATIONS.

The investigations of fruit diseases, in charge of Mr. M. B. Waite, have been conducted on about the same lines as in previous years, with the investigation of grape and small-fruit diseases in immediate charge of Dr. C. L. Shear, and spraying demonstrations in charge of Mr. W. M. Scott.

PREVALENCE OF FRUIT DISEASES.—The season of 1910 closed with only a moderate prevalence of diseases of the apple. The fruit spots and leaf blights were about average, though apple scab was moderately bad in the North and cedar rust exceptionally severe in the Appalachian Mountain region from Pennsylvania to Tennessee; yet the total injury by fungi was below the average. This was due partly to thorough spraying and partly to the dryness of the season. The peach crop, though heavy, was exceptionally free from fungous injuries.

In the spring of 1911 frost injuries accounted for the widespread destruction of peach blossoms from Pennsylvania southward. Much injury to apple blossoms was caused by frost, not only in the East, but in Colorado and in the Pacific Northwest. To the dry spring is due the remarkable freedom from the fungous fruit spots and leaf blights of the apple in the Eastern States, and this cause, together with the general cutting down of the red cedars in some sections, has greatly reduced the attacks of the cedar-rust fungus.

On the other hand, the extreme heat caused the new combination spray of lime-sulphur solution and arsenate of lead to produce a considerable injury on the fruits. This injury, while conspicuous on some specimens, covers only a small percentage of the crop and is insignificant in comparison with the benefits. The widespread use of lime-sulphur solution on the apple and the combined self-boiled lime-sulphur solution with arsenate of lead on the peach has resulted in the Eastern States in the production of a crop of very much finer quality than usual of both these important fruits. Experiments on the apple powdery mildew in California have been continued, giving excellent results in its control. A large number of fungicides have been tested both in California and in Virginia in the effort to still further improve the mixtures for spraying fruit trees.

PEAR-BLIGHT ERADICATION.—The work of pear-blight eradication in California has been continued about the same as last year, and excellent results have come through the widespread application of department methods by the growers. Reports from California indicate that the pear crop for the season of 1911 will be one of the largest and of the finest quality. The fine pear orchards of the Rogue River Valley, where Mr. P. J. O'Gara carried out the department methods, continue in their prosperous condition. Mr. O'Gara resigned his position in the department, but continues his work in the same locality, the people of the valley having employed him to devote his entire time to pear-blight eradication and similar work.

LITTLE PEACH AND PEACH YELLOWS.—The diseases known as little peach and peach yellows have been somewhat less severe in general over the country, though they were very destructive in some localities. As peach yellows seems to be progressing southward, an effort was made to find the southern boundary of the disease. This line has been partly mapped, particularly from the Atlantic seaboard through the Allegheny Mountain region.

PECAN SCAB.—Work on pecan scab, pecan rust, and other diseases of this excellent nut has been continued in South Carolina, Georgia, and Florida. Conclusive demonstration has been made that the scab can be controlled on both leaves and fruit by spraying with Bordeaux mixture; but the department ordinarily advises the plant-

ing of resistant sorts, so as to avoid the expenses of spraying, which are unusually great, owing to the height of the trees and the frequency of rains, in much of the pecan-growing territory. Fertilizer experiments have been continued in the effort to find out their effects in controlling pecan diseases, such as the drop of pecans and the failure of the nuts to fill.

WESTERN PHYSIOLOGICAL TROUBLES.—The extreme heat of the season of 1910 and other conditions not fully determined developed injury to the foliage and fruit, and in some places to the trees, in some of the irrigated orchards of the Rocky Mountain region. Some time was spent in studying this trouble, the disease was identified, and the conclusion reached that the injury is mainly due to the soil, though influenced by climatic conditions.

The chlorotic group of diseases, including the apple rosette, appears to be increasing in severity over many of the irrigated orchards of the Rocky Mountain region and the Pacific Northwest. Attention has been given to this trouble but no treatment has yet been discovered.

CITRUS DISEASES.—Laboratory work on citrus diseases has been continued. Urgent requests to take up numerous problems in citrus pathology have come from the citrus-growing districts. These problems relate to such diseases as the wither-tip and gum disease in California and Florida and the orange blight in Florida. The bureau, however, has not been prepared to give this work the attention it deserves.

FRUIT ROTS.—Laboratory studies on the fungous fruit rots have been begun during the past year. Little work on this important group of diseases has been undertaken by the bureau up to date.

GRAPE DISEASES.—The work on grape diseases has been continued in Michigan, New Jersey, and North Carolina. The very excellent results in the control of black-rot in Michigan have been repeated, and the grape growers there are practically all practicing successful methods of spraying. The work on grape anthracnose in Michigan has been remarkably successful, and there seems little doubt that this very destructive disease can be almost entirely prevented by a combination of dormant and summer spraying. The various forms of lime-sulphur have proved very unsatisfactory as substitutes for Bordeaux mixture for grape diseases.

CRANBERRY DISEASES.—Several series of spraying experiments for cranberry diseases are being conducted in Massachusetts in cooperation with the State experiment station. In New Jersey attention has been directed especially to the development and perfection of spraying apparatus adapted to the requirements of cranberry growers. Investigations of the cranberry gall disease, which has occurred again this season, and also of several obscure diseases which have been found in Massachusetts, are also being made.

MISCELLANEOUS DISEASES OF SMALL FRUITS.—Several diseases of small fruits are under laboratory and field investigation, and the life histories of a number of the organisms causing these diseases have been worked out. The details are being prepared for publication. The studies of the life histories of various kinds of anthracnose have been continued, and the results are nearly ready for publication.

DEMONSTRATION SPRAYING.—Demonstrations for the control of apple diseases by spraying gave very good results. A great deal of interest has developed on the part of fruit growers, resulting in the widespread application of department methods with excellent results to the crops. In the season of 1910 most of this work was done in the Eastern States, but the production of a general apple crop throughout the Middle West in 1911 afforded opportunity for again carrying on demonstrations in Michigan, Kansas, Missouri, and Arkansas as well as in Virginia, West Virginia, and Delaware.

Demonstrations are being made on the peach and stone fruits in Michigan, Delaware, and West Virginia. Demonstrations on the peach last year in Georgia, Virginia, and West Virginia gave almost perfect results and helped to stimulate the already well-developed interest in peach spraying.

ENFORCEMENT OF THE INSECTICIDE ACT OF 1910.—By an order of the Secretary, Mr. Waite was designated as the representative of the Bureau of Plant Industry on the Insecticide and Fungicide Board to assist in the enforcement of the insecticide act of 1910. The board has organized this work and has assigned to this bureau the problem of testing fungicides as to their efficiency in preventing plant diseases and their injurious effects on crops; also, in cooperation with the Bureau of Entomology, the testing of the injurious effect of insecticides when used on plants, together with other botanical work required by the board.

Within the bureau the work has been partly organized, Mr. Errett Wallace, with one assistant, has been employed, and tests of fungicides and insecticides (proprietary mixtures, arsenicals, etc.) entering into interstate commerce or for sale in the District of Columbia have been begun. The work so far has been done mainly at the Arlington Experimental Farm.

To enlarge the work and to increase its efficiency during the fiscal year 1912, it is proposed to equip a laboratory for carrying on the necessary research work in the department buildings and also to equip a field laboratory with the necessary orchards and gardens at Arlington.

PROPOSED PLANS FOR THE FISCAL YEAR ENDING JUNE 30, 1912.—It is proposed to continue the work, with some slight extensions, along the lines already under investigation. In the case of the citrus diseases, it is planned to take up the investigation more systematically and organize the research work on this important group; also to begin work on the fruit rots.

PROPOSED PLANS FOR THE FISCAL YEAR ENDING JUNE 30, 1913.—The plans include continuing the work on all the groups described and to still further increase the work on general orchard diseases. The physiological problems and western nutrition problems need further attention and the work on nut diseases should be pushed. It is proposed to increase the work on citrus diseases and to more thoroughly organize and increase the work on fruit rots.

INVESTIGATIONS IN FOREST PATHOLOGY.

CHESTNUT BARK DISEASE.—The work on the chestnut bark disease has been conducted under the immediate direction of Dr. Haven Metcalf. The continued advance of this disease has caused wide-

spread alarm, and so many calls for help and advice on this subject have been made by both State officers and private citizens that during the past year a great deal of time has been devoted to this subject. Since whatever is done to control this disease must apparently be done within the next three years, the work on the general diseases of ornamental and shade trees has been suspended for the time being, as well as all work in the East on the damping-off diseases; and many minor features of other projects have been curtailed in order to apply more time and money to the study of the chestnut bark disease.

The methods of quarantine and destruction of advance infections advocated by this bureau have been put into execution in the State of Pennsylvania, where an adequate appropriation has been made by the State for the work; and if the results of the cooperative work now going on in Massachusetts, Rhode Island, New York, and Maryland indicate that the disease has not spread too far it is probable that similar work will soon be organized in those States.

Plans for the present year involve a continuation of the work already begun, namely (1) extensive field and laboratory studies of the nature and spread of the disease, (2) cooperative surveys of the various States to determine the practicability of an organized stand against the disease, and (3) studies of possible methods of curing individual trees already affected. Plans for next year are to further continue this same work, as may be found necessary, but with particular reference to the Southern States, since it is imperative that, if possible, the disease be prevented from spreading south of the Potomac River.

A Farmers' Bulletin on this subject is now in press and a technical bureau bulletin ready for press.

BLISTER RUST OF THE WHITE PINE.—Work on the blister rust of white pine, under the immediate direction of Dr. Perley Spaulding, has continued with success, since, so far as can be ascertained, the disease has not even yet obtained a permanent foothold in the United States. But importations of diseased stock are still freely made. It is obvious, therefore, that work on this disease must continue until the importation of nursery stock of this species is prohibited by law. No other entirely practicable method of dealing with this disease has been suggested.

FOREST HYGIENE.—Work on forest hygiene has been carried on for several years by Dr. George G. Hedgcock. The preliminary work indicated, as previously reported, that great reduction of disease in forests and decay in cut timber can be made by certain modifications and refinements of current forest practice and wood-preservation methods. Work on this basis, in close cooperation with the Forest Service, has now been carried on for more than a year. In district 5 of the Forest Service Dr. E. P. Meinecke has been particularly successful in bringing about changes in timber-sale contracts, involving the routine destruction of diseased trees, so that only healthy trees are left to be progenitors of the future forest. This work will be extended to districts 1, 2, and 3. From the locating of an expert forest pathologist in each of the national districts much is to be expected, particularly in the suppression of new or imported diseases. For example, if the chestnut bark disease had

started in a National Forest, instead of in New York, it would have been eradicated as a matter of routine before infection could become general. The continuation of this work without change of personnel or policy during the fiscal years 1912 and 1913 is contemplated.

COTTON AND TRUCK-CROP DISEASES AND SUGAR-PLANT INVESTIGATIONS.

The investigations of cotton and truck-crop diseases and of sugar plants have been continued during the year in charge of Mr. W. A. Orton. A brief summary of the progress made in these lines of work follows. Assisting in the investigations during all or a part of the year have been H. A. Edson and J. B. Norton, physiologists; L. L. Harter, W. W. Gilbert, F. J. Pritchard, and H. B. Shaw, assistant pathologists; F. A. Wolf and W. B. Clark, experts; C. F. Clark, G. F. Miles, Miss Ethel C. Field, and Miss Clara O. Jamieson, scientific assistants; and J. F. Reed and E. C. Rittue, assistants.

SUGAR-PLANT INVESTIGATIONS.

The work on sugar-plant investigations has been materially extended during the past year. Field stations have been established at Garden, Kans., and Rocky Ford, Colo. Most of the work formerly conducted at Garland, Utah, has been transferred to Ogden, Utah.

SUGAR-BEET DISEASES.—The work on the control of the curly-top is being continued with the purpose of discovering remedial measures and to gain a more thorough knowledge of the physiological operation of the disease.

The station at Rocky Ford was inaugurated for the express purpose of thoroughly studying the leaf-spot disease (*Cercospora beticola*), looking to the discovery of the complete life history of the fungus and effective methods of control. A pathologist and assistant are stationed on the ground, where adequate laboratory facilities with about 20 acres of experimental plats and ample greenhouse facilities have been placed at their disposal through cooperation with the American Beet Sugar Co.

Work upon the root troubles of sugar beets to be conducted at various field stations and in Washington is contemplated for the ensuing year.

CULTURE OF THE SUGAR BEET.—Agronomic studies having in view improvements in the culture of sugar beets under the direction of Dr. C. O. Townsend, collaborator, have been begun at the field stations, particularly in Garden, Kans., where a large acreage and ample laboratory facilities have been placed at the disposal of the bureau. Demonstration work looking to the adoption of improved cultural practice has been inaugurated in the Arkansas Valley in cooperation with the Holly Sugar Co.

IMPROVEMENT OF THE SUGAR BEET.—The breeding work has been very much increased and thoroughly reorganized during the past year. Single-germ breeding is being continued, while the breeding of beets for improved yield and quality has been very much extended. Breeding for alkali and drought resistance and for early-maturing strains is being continued along former lines.

PROGRESS OF THE BEET-SUGAR INDUSTRY.—The work on the beet-sugar industry was conducted as heretofore under the direction of Mr. Charles F. Saylor until his death, which occurred during the past spring. The continuance of the work, possibly in a modified form, is contemplated.

SPECIAL SUGAR-PLANT INVESTIGATIONS.—The work upon sorghum has been continued along former lines and plans made for its material extension.

The work upon the bacteria of maple sap has been continued, the field studies having been completed. It is hoped that the work upon this problem can be closed up during the ensuing year.

Preliminary work upon the diseases of sugar cane has been begun and plans for its extension are formulated.

COTTON DISEASES.

The breeding work with wilt-resistant varieties of cotton has been continued, and more than 2,000 bushels of seed of the Dixie and Dillon varieties were grown last season under our supervision by cooperating farmers and were sold by them for use in wilt-infected territory. The spread of wilt and root-knot has greatly increased. To meet the situation work has been successfully begun in cooperation with the Office of Farmers' Cooperative Demonstration Work of this bureau, the South Carolina Agricultural Experiment Station, and the Georgia State Board of Entomology to increase very materially under competent supervision the production of seed of reliable wilt-resistant varieties of cotton. This work is unifying all the agencies in the southern field for the more effective introduction of wilt-resistant varieties into agriculture and the dissemination of information with regard to the control of cotton and cowpea wilt and root-knot. The extension of this work to other States is planned as soon as funds are available. The work having for its object the production of wilt-resistant varieties adapted for use in boll-weevil territory is making satisfactory progress and will be continued.

TRUCK-CROP DISEASES.

BREEDING WILT-RESISTANT WATERMELON.—The watermelon breeding work has been continued. Two hundred pounds of seed of the new Conqueror, a wilt-resistant melon bred by this bureau, are being grown for the coming winter's distribution. Additional work in the development of strains adapted to use in the Pacific States is planned.

SWEET-POTATO WORK.—A new line of work on the diseases of sweet potatoes has been started and is being actively pushed. It is expected that important information relating to the causes of the diseases, the life history of the causal organisms, and the proper field treatment for the control of the troubles will result.

BREEDING RUST-RESISTANT ASPARAGUS.—Asparagus breeding work has been continued during the past year. The first pedigree seedlings from select rust-resistant plants were grown in 1910 at Concord, Mass. A severe attack of rust on the station grounds showed that some of these pedigree lots were highly resistant to rust and demonstrated the complete success of the breeding methods. One male

plant has been found that transmits to its offspring both rust resistance and increased vigor in a marked degree. This plant is being used with the best female plants to develop progenies of practically rust-immune asparagus. The best breeding plants are being propagated by division to increase the output of resistant seed. The extension in the near future of this work to the Southern States is planned.

DEMONSTRATION SPRAYING.—A very important line of work in the demonstration spraying of cantaloupes and cucumbers is being started this season in Florida and New Jersey. Large financial losses are annually caused by leaf diseases preventable by spraying, and in many sections the industry has been given up because of these diseases.

MISCELLANEOUS DISEASES.

An investigation of ginseng diseases in cooperation with the Cornell University Agricultural Experiment Station has been undertaken. Malnutrition studies have been continued and two bulletins giving the practical results of the work have been published through the Virginia Truck Experiment Station at Norfolk, Va.

The cowpea breeding work to secure varieties resistant to wilt and root knot which are more productive and erect than the Iron has been continued and this year the most promising strains are being increased to provide for more extended trials next season.

A plant-disease survey of the San Antonio, Tex., area has been completed and a report on the work is in press.

SOIL-BACTERIOLOGY AND WATER-PURIFICATION INVESTIGATIONS.

The investigations in soil bacteriology and water purification have continued in charge of Mr. Karl F. Kellerman.

WORK WITH NODULE-FORMING BACTERIA.—Pure cultures of nodule-forming bacteria for inoculating approximately 25,000 acres of leguminous crops were distributed during the fiscal year 1911. The use of pure cultures is believed to be one method of avoiding the dissemination of crown-gall, which affects leguminous crops as well as orchard trees.

During the fiscal year ending June 30, 1912, more detailed field work will be taken up in connection with the experimental distribution of these pure cultures, and it is planned to continue the field investigations in connection with the laboratory and field studies upon the correlation of bacterial growth and crop production.

FARM WATER SUPPLIES.—Advisory correspondence in regard to the improvement of farm water supplies has been carried on and in some cases personal supervision of improvements has been undertaken. This work will be continued and occasionally supplemented by demonstrations of simple methods for improvement during the present and coming fiscal years.

STUDIES IN SOIL BACTERIOLOGY.—Detailed studies of certain bacterial conditions obtaining at Fallon, Nev., Logan, Utah, and in the vicinity of Washington, D. C., have been carried on. These studies cover the investigation of the relative nitrifying and nitrogen-fixing power

of agricultural soils in the regions mentioned and the isolation and correlation of the cellulose-dissolving organisms from different types of soil. During the fiscal year 1913 the relation of cellulose destruction by various types of soil organisms, especially in connection with the utilization of different types of green manures, to crop-producing power will be investigated both under greenhouse conditions at Washington and under field conditions at Fallon and other points in the West.

CROP-PHYSIOLOGY AND BREEDING INVESTIGATIONS.

The investigations in crop physiology and breeding have been continued during the year under the immediate direction of Mr. Walter T. Swingle, assisted by Prof. S. C. Mason, arboriculturist in charge of dry-land arboricultural investigations; Mr. G. P. Rixford, expert in fig investigations; and Mr. E. M. Savage, assistant plant breeder. They have for their object the determination of the exact climatic, soil, and cultural requirements of important crop plants. A study of the factors underlying the physiology of crop production is essential not only for the determination of the best methods of culture and the special treatments demanded to insure success in given localities, but also to determine the direction in which plants can most advantageously be modified by the plant breeder. An especial feature of the work has been the search for deep-rooted and drought-resistant tree crops better adapted for culture in the dry-land regions of the United States than the shallow-rooted annual crops now grown.

HARDY CITRUS FRUITS.—This work, which is of great interest to the people living in the cotton belt, has been pushed vigorously during the past year. At present some 5,000 hybrids a year are being made and about 15,000 hybrids are under observation, constituting probably the largest collection of hybrid fruits of definitely known parentage under study in this part of the world.

At the same time, through the cooperation of the Office of Foreign Seed and Plant Introduction, a number of very hardy types of citrus fruits which promise to give better hybrids than any now under observation have been obtained from Australia, Asia, Africa, and other regions.

In particular, the Australian desert lime, the hardiest of all the evergreen citrus fruits, is of the greatest promise in breeding new types. In addition to bearing edible fruits, it is drought resistant and has the very desirable quality of remaining dormant during spells of warm weather in winter.

It is now clear that some four or five new types of citrus fruits can be produced, covering all of the Cotton States and ranging from Florida to the Ohio and Potomac Rivers. For the regions just outside the present limits of citrus culture, hardy types of oranges and grape fruit suitable for eating from the hand will undoubtedly be produced, as well as hardy lemons and limes, while for the northern limits there will be deciduous trees bearing small fruits suitable for making ade and for general culinary purposes.

The entire line of this work is proving of such unusual promise that it will be pushed even more vigorously during the coming year than in the past.

FIG CULTURE.—Between 5,000 and 10,000 seedlings of the best varieties of Smyrna figs are being distributed annually, together with cuttings of choice varieties of figs and caprifigs. The same variety is being tried in many different localities in order to test each sort thoroughly.

From the Maslin seedling fig orchard at Loomis, Cal., under lease by the department, choice caprifigs are distributed to the smaller growers whose orchards are just coming into bearing and whose caprifig trees do not yet yield fruit. The ordinary caprifigs do not come into bearing as soon as the Smyrna figs.

The Milco caprifig has proved to be of very great importance, as it has been able to support the fig insect (*Blastophaga*) all the year around.

A large number of new types of Smyrna figs have been tested in the foothill regions of California in the hope of finding varieties adapted to those climatic conditions. It is believed that the foothills will be suitable for growing the very best grades of Smyrna figs, although the crop will not be so large as in the hot and more fertile valleys below.

A study of the wild species of figs related to the cultivated sorts has been undertaken and several promising discoveries have already been made. Among others, a caprifig from Abyssinia has been found which is unusually vigorous in growth and which produces pollen in the winter-generation caprifigs. This permits the caprification of the first crop of the Smyrna figs, the brebas, or spring figs, which heretofore have never been caprifigged. Investigations are now under way to determine whether this caprification can not be done on a commercial scale. This is a matter of very great importance, since caprifigged figs are freer from disease, keep better, and are of better flavor than the uncaperfigged figs.

COOPERATIVE WORK ON THE INDIAN RESERVATIONS.—During the past year satisfactory progress has been made in the development of new crops in cooperation with the Office of Indian Affairs, Department of the Interior. Already at least two new industries have been established among the Indians on the Pima Reservation at Sacaton, Ariz., the culture of superior grades of acclimatized Egyptian cotton and the growing of choice disease-free Bermuda onions. Some of the more progressive Indians are now successfully growing these crops. At the same time experimental cultures on a large scale are being carried on at the Cooperative Testing and Demonstration Garden, Sacaton, Ariz. The selection of new varieties and the improvement of cultural methods are being made the subject of a thorough investigation.

In addition to cotton and onions, a large number of fruit and nut crops are being tested, including the date palm, fig, pistache, and citrus fruits. A dry-land olive orchard is also being established on the Pima Reservation near the Sacaton garden.

The great advantage of this work on the Indian reservations lies in the fact that the Indians not only learn to grow the crops, but they are also trained in handling these crops and become skillful helpers for the white settlers in the adjoining regions. This latter point will prove of the utmost importance when these industries expand, as they are sure to do.

Quite a number of seedling figs, dates, and other plants have been grown for distribution among the Indians. As in the case of other cooperators, these Indians are expected to grow a certain number of seedlings for every named variety given them. This means that they will be breeding new varieties at the same time that they are testing the old and well-known varieties.

DATE CULTURE.—Cooperative date orchards are now maintained in Texas, Arizona, and California. The first offshoots were sent to these gardens in 1899 and the first large planting made in 1900. The success of date culture is now assured in all three States, and hundreds of private growers are cooperating with the bureau in testing imported varieties and in breeding new types.

The larger cooperative gardens at Tempe, Ariz., and Mecca, Cal., have both produced large quantities of choice dates. Several tons were produced last year, and a good crop is expected this year.

The investigations of the University of Arizona have brought to light a new method of ripening dates, and this has been modified and in some ways improved for use under Californian conditions. This discovery enables certain late varieties to be ripened artificially and to be marketed with great success.

The artificial ripening of dates places the culture of this fruit on an entirely new plane in a State like Texas, where the ordinary varieties are subject to injury by the early rains in autumn. Late-ripening sorts which can not pass through this rainy season can now be grown with the assurance that the fruit when once it attains full size can be ripened artificially within 24 hours.

Inasmuch as plantings of dates are now being made on a considerable scale, it becomes necessary to test all obtainable sorts which have an established reputation in European or American markets. Arrangements have been made with the Office of Foreign Seed and Plant Introduction to secure the varieties which have not yet been introduced into this country.

The introduction of varieties of known value is a matter of the greatest importance, since the date palm, unlike ordinary fruit trees, can not be grafted, and if by any chance the wrong varieties should be planted the orchard is likely to prove a total loss. With most growers this would prove a financial disaster, since the cost of imported offshoots is high, and it involves considerable expense to bring them into bearing.

ACCLIMATIZATION AND ADAPTATION OF COTTON, CORN, AND OTHER CROPS.

The investigations directed toward the acclimatization and adaptation of varieties of cotton, corn, and other crop plants that have originated in tropical countries have continued under the general supervision of Mr. O. F. Cook, assisted by Mr. G. N. Collins. Different branches of the field investigations are conducted by J. H. Kinsler, F. L. Lewton, A. McLachlan, H. Pittier, and D. A. Saunders. Particular attention is being given to the adaptive characters, environmental reactions, and methods of breeding and local adjustment of varieties of cultivated plants in order to determine the best methods of improving the crops, securing increased resistance to unfavorable conditions, diseases, and insect enemies, and extending the range of cultivation in the United States.

BREEDING AND TESTING NEW VARIETIES OF AMERICAN UPLAND COTTON.—The breeding and testing of new varieties of American Upland cotton have been continued, with special attention to long-staple varieties of the Texas big-boll type. A promising new variety bred in Texas by Dr. D. A. Saunders has been included in the Congressional distribution of the present year under the name of "Lone Star."

DISTRIBUTION OF NEW VARIETIES OF COTTON.—The former policy of making only a single distribution of a superior new variety has been modified. The purity of a new stock is usually destroyed in the first season, because most farmers prefer to test the value of a new variety by planting a few rows in a field of other cotton. It has been concluded, therefore, that two or three distributions of one superior variety are likely to be of more use than single distributions of a larger number of varieties. The chief object is not to increase the number of varieties, which is already too large, but to encourage the widest utilization of the best varieties.

LONG-STAPLE UPLAND COTTON IN THE ATLANTIC STATES.—The advance of the boll weevil has reduced the production of long-staple Upland cotton in Mississippi and Louisiana, resulting in an acute commercial demand for this type of fiber. The high prices realized by eastern growers of the Columbia long-staple Upland cotton have stimulated popular interest in this variety to the extent that all the available supplies of good seed were long since exhausted. Special efforts are being made to preserve the uniformity of this variety by growing new supplies of seed under conditions of isolation from other cotton and by more effective cooperation in the work of selection.

ACCLIMATIZATION OF CENTRAL AMERICAN COTTONS.—The breeding and testing of select strains of cotton derived from acclimatized Central American varieties is being continued, with very favorable results in comparison with the best selections of American Upland varieties. In addition to habits of growth that lessen weevil injuries, some of the new types are extremely prolific and yield lint of excellent Upland quality.

RELATION OF DROUGHT TO WEEVIL RESISTANCE.—A report has been published showing the importance of dry weather in relation to other factors of weevil resistance of cotton and the possibility of utilizing the beneficial effects of drought to a larger extent by the improvement of cultural methods and the breeding of weevil-resistant varieties.

EARLINESS AS A FACTOR UNDER WEEVIL CONDITIONS.—A study of the subject of earliness of cotton has been completed and a report published. The conclusion is that the form of earliness most valuable as a means of avoiding injury by the boll weevil is the shortening of the period of development of the crop, the interval between the development of flower buds and the growth of the bolls beyond the range of weevil injury. Earliness measured by dates of planting or opening of first flowers or bolls is less important. Experiments have shown that cotton planted too early and checked by cold weather may mature a later and smaller crop than adjacent rows planted at a later date.

IMPROVEMENT OF QUALITY UNDER WEEVIL CONDITIONS.—The increased cost of producing cotton in regions infested by the boll weevil makes it more important than ever to improve the quality in order to maintain the industry on a remunerative basis. Experiments have shown that the special methods of culture required to avoid boll-weevil injury by shortening the period of development also improve the fiber. These considerations add to the practical value of the work that has been done in the improvement of the staple of Upland varieties that are to be grown under boll-weevil conditions.

PRESERVATION OF SUPERIOR VARIETIES OF COTTON.—A study of the causes of degeneration of cotton varieties has resulted in the development of an improved method of selection for preserving the uniformity of superior varieties of cotton. The preservation of uniformity in cotton is a factor of enormous practical importance. Experiments have shown that both yield and quality are affected, the increase from selection often amounting to 10 per cent and upward. The new method is based on the fact that undesirable variations can be recognized by their vegetative characters before the flowering stage is reached, so that crossing with the pollen of the inferior plants can be avoided. This was not possible under the old method of deferring selection till the bolls were open at the end of the season. The new method of selection is also superior to the old in being more quickly and easily done and with a smaller reduction of the crop.

NEW VARIETIES WITH DISTINCTIVE CHARACTERS.—Since the value of a superior variety of cotton depends very largely upon the preservation of uniformity after it has been introduced into cultivation, the possibilities of maintaining uniformity must be taken into account in breeding. Varieties with distinctive peculiarities are the more valuable because it is much easier to detect and remove undesirable individual variations that would destroy the uniformity of the stock if allowed to remain. New varieties with readily distinguishable characteristics are being bred and distinctive characters of existing varieties are being determined, in order to give a better basis for selection.

COTTON IMPROVEMENT ON A COMMUNITY BASIS.—A general study of the subject shows that many factors of the improvement of cotton could be much more effectively utilized if cotton-growing communities were organized to grow a single variety of cotton and to maintain its uniformity by selection. The present multiplicity and mixing of varieties is a serious obstacle to the improvement of the cotton industry. In a community that planted only one kind of cotton the crossing of varieties in adjacent fields and the mixing of seed in gins would be avoided, selection could be made much more effective, and the production of a larger quantity of uniform fiber would insure higher prices. In view of these and other obvious advantages it is proposed to give special attention to establishing improved varieties and methods of selection in communities organized for the production of a single type of cotton.

MALFORMATIONS OF COTTON SEEDLINGS.—Malformation of the leaves, accompanied by frequent abortion of the terminal buds, is a widespread disorder of young cotton seedlings. It hinders the growth of the plants and causes the development of abnormal sterile branches. Though generally confused with the leaf-curl caused by plant lice,

the juvenile leaf-curl proves to be quite distinct and does not seem to be due either to insects or to fungous parasites. Experiments are being made to determine methods of avoiding these malformations and of reducing the losses they occasion.

CONTROL OF BRANCHING HABITS OF COTTON.—It has been found that under conditions of luxuriant growth the cotton plant develops vegetative branches at the expense of fruiting branches, resulting in a later and smaller crop. Experiments are being made to test the possibility of avoiding these difficulties by the restriction of the growth of the plants in the early stages and by the selection of strains with less tendency to the production of vegetative branches.

IMPROVED METHODS OF CULTURE FOR IRRIGATED DISTRICTS.—In view of the probability that cotton will become one of the chief crops in the irrigated districts of the Southwestern States where the danger of weevil injury is less serious than in the more humid eastern districts, attention is being given to the special culture factors of the southwestern region. It has become apparent that much injury has been done by the excessive use of water, especially in the earlier part of the growing season, the ability of the cotton plant to resist drought being generally underestimated. In localities where the natural rainfall assisted by dry-farming methods provides moisture for the germination of the seed, it is better to use irrigation only to protect the maturing crop against injury by too severe drought.

HINDI COTTON IN EGYPT.—A report on Hindi cotton in Egypt, based on a study of the Egyptian cotton industry in the season of 1910, shows the extent of the injury inflicted by the Hindi contamination of the Egyptian type of cotton. From countings of the numbers of Hindi individuals and hybrids in many cotton fields in different localities in Egypt it appears that the annual loss from this cause amounts to several millions of dollars.

PRECOCITY OF THE HINDI COTTON.—Seedlings of the inferior Hindi type of cotton have been found to germinate more promptly in dry soil and usually outgrow genuine Egyptian seedlings in the same hills. The precocity of the Hindi seedlings explains why the Hindi contamination of the Egyptian cotton has continued to increase in Egypt in spite of the attempt to remove it by seed selection. The native Egyptian cultivators are likely to spare the largest plant in the hill at the time of thinning. More careful methods of selection may be expected to effect a complete exclusion of the Hindi contamination from the Egyptian cotton that is being grown in the United States.

CHARACTERS OF COTTON SEEDLINGS.—Characters of the seedlings of numerous varieties of Egyptian and Upland cotton have been compared with a view to the development of methods for detecting undesirable variations in the early stages of growth. It has been found that the Hindi variations of Egyptian cotton can be recognized immediately after germination by differences of the cotyledons or seed leaves.

COMMERCIAL VALUE OF COLOR CHARACTERS IN EGYPTIAN COTTON.—The popularity of the brown varieties in Egypt may be explained

by the Egyptian system of sorting the crop by hand to remove the inferior Hindi fiber, which is pure white in color. A study of heredity in cotton has revealed the fact that brown color and length of fiber are incompatible characters, not readily secured or maintained in combination. Longer and stronger fiber is obtained from very pale or white varieties. Such fiber has been raised in Arizona and southern California and has brought higher prices than imported Egyptian fiber.

ADAPTATION OF EGYPTIAN METHODS OF COTTON CULTURE TO AMERICAN CONDITIONS.—Though it is not practicable to establish the Egyptian system of cotton culture in the United States, owing to the much greater cost of the hand labor required, some of the Egyptian methods can be adapted to machine cultivation. The most important advantage of the system is that it enables the development of vegetative branches to be controlled through closer planting and the restriction of the supply of water in the early stages of growth. Excessive vegetative growth that delays the maturity of the crop and increases the expense of picking is the most serious obstacle to the development of an Egyptian cotton industry in the irrigated districts of southern California and Arizona, the production of high-grade fiber having been demonstrated in numerous plantings.

FACTORS OF HEREDITY IN COTTON.—In conducting experiments in the acclimatization and breeding of cotton it has been necessary to take account of the different principles or factors of heredity that influence the behavior of the plants. As these experiments cover a wide range of species and varieties of cotton brought from many different regions and grown under many different conditions in the United States, they afford an unusually broad basis for determining the relations that call forth or prevent the development of the different characters. The results of these investigations are contributing to the solution of general problems of heredity and the development of improved methods of breeding.

FIRST-GENERATION HYBRIDS IN SWEET CORN.—Sweet corn has been found to be no exception to the rule that hybrids yield more than their parents, while quality and uniformity do not suffer if well-selected strains are used. Since most of the sweet-corn varieties sucker abundantly and produce a succession of tassels, the proportion of self-pollinated seed is larger than in most of the varieties of field corn. Unless precautions are taken to insure cross-pollination the yield and vigor of the stock are greatly reduced.

IMPORTANCE OF ELIMINATING SELF-POLLINATION IN CORN.—While the deleterious effect of self-pollination has long been appreciated, the extent to which seed is self-pollinated under ordinary field conditions seems never to have been fully realized. The reduced yields due to planting self-pollinated seed can be eliminated by removing the tassels from the plants of alternate rows and using the seed from detasseled plants. In western Kansas, where the prevailing high winds might be expected to reduce self-pollination to a minimum, seed selected from detasseled plants outyielded selections from the general field by 40 per cent. While the extent of self-pollination indicated by this experiment may be exceptional, there can be little doubt that the yields of corn can be materially increased by the elimination of self-pollinated seed.

CROSSES BETWEEN NORTHERN AND SOUTHERN VARIETIES OF CORN.—In connection with the increased yields of first-generation hybrids previously reported it has been found possible to utilize the more highly bred northern strains in combination with southern varieties. In the high-yielding northern varieties the husks do not afford sufficient protection to the ears under conditions in Texas. Though in most cases the yield is large, the high percentage of damaged ears greatly reduces the value of the crop. In first-generation hybrids between northern and Texas varieties it was found that the ears were almost as well protected in the hybrids as in the pure Texas varieties.

IMPROVED METHODS OF MAKING CORN HYBRIDS.—In determining the value of first-generation hybrids large numbers of artificial pollinations have been made, representing many different hybrid combinations for testing under different conditions. In connection with this work improved methods have been devised, so that much larger numbers of crosses can be made in the limited flowering period of the corn plant.

CORN PLANTS THAT FAIL TO PRODUCE POLLEN.—It has been found that under certain conditions some well-bred varieties produce very little viable pollen. The tassels appear normal, and the anthers are well formed, but careful inspection discloses the fact that no pollen is shed. It is important that this condition be guarded against in the selection of seed corn, as its prevalence will result in poorly formed ears and reduced production of grain.

CULTURAL IMPROVEMENTS IN OTHER TROPICAL CROPS.—Several of the most important tropical crop plants—cotton, coffee, cacao, the Central American rubber tree, and the banana—have been found to produce two or more kinds of branches, distinct in their positions, functions, and powers of propagation. A report has been published describing these specialized habits of growth and their application to methods of culture and pruning.

DRUG-PLANT, POISONOUS-PLANT, PHYSIOLOGICAL, AND FERMENTATION INVESTIGATIONS.

The work of the past year has in a general way continued the lines of investigation hitherto pursued, and the organization of the office has continued practically unchanged, Dr. R. H. True, physiologist, having general charge of the work.

DRUG-PLANT INVESTIGATIONS.

As heretofore, the work has been conducted along two general lines: (1) Field investigations, carried on in the various testing gardens and with various cooperators of the office; and (2) laboratory investigations, carried on chiefly in the laboratories at Washington.

ARLINGTON TESTING GARDEN.—The garden on the experimental farm at Arlington, Va., during the past year has been placed under the direct charge of Dr. Walter Van Fleet, expert in plant breeding, who was formerly connected with the introduction work at Chico, Cal. The work of the garden consists to a considerable extent in growing under observation small plot cultures of a large number of drug and related plants from foreign sources, in order to determine their cultural requirements and value for introduction.

SOUTH CAROLINA TESTING GARDEN.—With the close of the season last year active cooperation in the growing of Hungarian paprika in Florence County, S. C., was withdrawn. Attention is now being given to various sorts of pungent peppers in order to develop the cultivation of Cayenne types. Fifteen acres of experimental peppers are now being grown, about six of the most promising varieties obtained being under observation.

FLORIDA TESTING GARDEN.—In the work of the Florida testing garden the culture of plants yielding volatile oils has come to occupy an important place, conditions found in that State seeming to favor their development. Several native plants seem to give unusual promise, especially the horse mint (*Monarda punctata*) characteristic of the sandy lands common in Florida. This plant yields an oil rich in the valuable constituent thymol, now a rather important imported article. It is hoped that *Monarda* growing in Florida may become profitable and that a home supply of its products may result. Several other oil-yielding plants, including the rose geranium and bergamot mint, give distinct promise for the future.

WISCONSIN TESTING GARDEN.—During the past year the number of varieties under test at the garden in Wisconsin has been more than doubled. The common fireweed, which develops in stubble fields in neglected places, has been found to grow well under cultivation and to yield a good quantity of a volatile oil containing a large proportion of limonene, a substance which it is hoped may find extensive use in the paint and varnish industry.

SPECIAL PROBLEMS.

CAMPBOR INVESTIGATIONS.—During the past year the camphor work at Orange City, Fla., has met with a severe check from the heavy frosts of the winter. Well-established trees seem to have been little damaged, but nursery stock and field plantings not yet well established suffered more serious losses. The outcome seems to indicate that this danger may be in large share eliminated by changing somewhat the method of handling the young plants. The efforts of the year have been concentrated on getting the hedges planted and a factory equipped in order to permit the harvesting of an experimental crop at as early a date as possible.

PERFUMERY AND VOLATILE-OIL INVESTIGATIONS.—In conjunction with the cultural tests of volatile-oil plants at the Virginia, Florida, and Wisconsin testing gardens, the physiological conditions governing the constitution of volatile oils have been under investigation, the results obtained having in part been reported in a publication on this subject. In response to demands made upon the office fixed oils, such as China wood oil (tung oil), the oil from pecans, and oils from soy beans (40 varieties), from the sunflower, and from a number of other plants are being studied with promising prospects of success. Work is also being done on the fixed oil occurring in the waste raisin seeds of the California fruit industry, the object being to determine the value of this product.

HOP INVESTIGATIONS.—During the past year the hop investigations have been continued both in the field and the laboratory. The hop-

breeding work in California promises to develop valuable new strains. Improved methods of handling and cultivating already worked out are being applied by practical hop growers, and new points on pruning, fertilizing, and otherwise treating the plants are being carefully investigated. Laboratory studies of volatile oils, resins, acids, and other important constituents of hops in their relation to yield, quality, etc., are being carried on. Suggestions looking toward the judging of hops on the basis of their properties and constituents rather than on their supposed geographic origin have attracted wide attention among growers and users and promise to bear fruit in a practical way, since it is believed that the adoption of such standards will go far toward removing certain sorts of discrimination which are at present made against American hops.

TANNIN AND DYE-PLANT WORK.—The investigation of wild tannin plants of the United States with reference to their availability and value has been continued. Analyses of tannin extracts from a number of native plants have been made, and leather samples tanned with extracts from this experimental material have been obtained. Technical difficulties, such as variations in the shade of leather tanned from different samples of the same plant, have been encountered and remain to be worked out. The experimental cultivation of several of the more promising tannin crops has been undertaken.

TEA-CULTURE INVESTIGATIONS.—The work in tea culture carried on in cooperation with Dr. Charles U. Shepard, of Summerville, S. C., has continued to give favorable results. The new season, although somewhat discouraging from the standpoint of rainfall, has given a satisfactory tea yield. From the present outlook it seems likely that the best record of the experiment will be equaled. The efforts of Mr. George F. Mitchell to introduce machinery methods where hand-work is now used have proved successful in the matter of pruning. The pruning machine has been successfully used during the past season to give both the flat and convex type of cut. The tea-picking apparatus is now receiving attention and some small samples of machine-picked tea have been obtained.

POISONOUS-PLANT INVESTIGATIONS.

LOCO-WEED INVESTIGATIONS.—Laboratory studies are being continued in the search for the active principle responsible for the characteristic effects of loco poisoning. The problem is an exceedingly difficult one and a continuance of the investigation is required. The observations of European scientists as to the occurrence of an alkaloid in the loco plant have been verified. Studies of this alkaloid, however, have not shown it to be very toxic. Evidence of toxic saponins has been discovered in these plants and efforts are at present being directed toward their isolation.

LARKSPUR POISONING.—Such species of larkspur as are available at the feeding camp near Baldwin, Colo., have been investigated, and antidotal treatment has been worked out and tested with promising results.

COOPERATION WITH THE FOREST SERVICE.—A number of forests in which much plant poisoning occurs have been visited and carefully

investigated in a botanical way. In general it has been relatively easy to point out the plants which are likely to be troublesome, and in many cases it has been possible to suggest methods of avoiding losses of live stock. Sometimes a change of trail is sufficient to help, at other times a change in the season of grazing certain areas. Where the offending plants are not too abundant it seems feasible to dig them out. The work has been greatly facilitated through the full and helpful cooperation of the Forest Service.

RELATION OF CORN TO PELLAGRA.—The study of spoiled corn has been continued with new and interesting results. Such molds as are likely to appear on corn have been studied, in cooperation with Dr. Erwin F. Smith, pathologist, and the substances formed by these corn-infesting molds have been submitted to biochemical and physiological investigation. As a result certain molds found on corn have been found to develop toxic products on corn-culture media as well as on other media. While it is not yet demonstrated that these molds stand in immediate causal relation to pellagra, an important possibility is suggested.

Methods of testing spoiled corn for products of deterioration have been developed on a practical basis and laboratory methods have been devised and made available by publication which have been adopted in food investigations both in the department and in the organizations of different States.

MISCELLANEOUS POISONOUS-PLANT WORK.—During the year the usual number of inquiries have been received concerning the possible poisonous properties of a large number of plants. The occurrence of prussic-acid poisoning has received some attention, it being thought possible that several plants not now regarded as harmful might be possible sources of this trouble. Although in most cases negative results have been obtained, the demonstration of this active poison in others has seemed to warrant a wider extension of the work, which it is hoped may be taken up during the coming fiscal year. The occurrence of an outbreak of sheep and cattle poisoning near Wilmington, N. C., supposed to be due to *Amianthium muscaetoxicum* or fly poison, locally known as "stagger plant," was investigated in the laboratory. A small amount of material obtained for experiment gave evidence of toxicity. Demands upon the office elsewhere rendered it impossible to press the investigation as fully as its importance seemed to warrant, but it is hoped that more complete results may be obtained during the coming season. A number of other plants suspected of causing losses by poisoning in the East have been examined and further investigations are planned.

PHYSIOLOGICAL AND FERMENTATION INVESTIGATIONS.

PHYSIOLOGICAL STUDIES.—The vegetable storage work carried on by Dr. Heinrich Hasselbring has been continued in cooperation with Prof. L. C. Corbett, horticulturist, and results of importance in connection with sweet potatoes have been obtained. It appears probable that physiological factors play a very important rôle in bringing about the rapid decay of this important product, and it is hoped that through a better understanding of the conditions methods of decreasing these losses may be developed. In cooperation with the Office of

Cotton and Truck-Crop Diseases and Sugar-Plant Investigations this office has been studying certain physiological factors affecting cabbage and spinach under conditions frequently found in trucking regions, and suggestive results have been obtained. In cooperation with the same office the curly-top of sugar beets has received some attention, especially from the standpoint of photosynthetic and respiratory functions. It is hoped that with a better understanding of the physiological processes underlying these diseases effective preventive measures may be devised.

The laboratory study of the physiological significance to plants of certain chemical substances in dilute solutions has been continued. It is clear that the normal behavior of the crops mentioned and others is to a considerable extent influenced by the properly constituted supply of inorganic salts in proper concentration. The question, therefore, of the effect of dilute solutions of these salts on these crops is a vital one. Accordingly, during the past year the effects of dilute solutions bearing in minute proportions the most important inorganic salts have been studied in their relation to beets, peas, and other truck crops. It has been demonstrated that calcium and magnesium in extreme dilution are very important constituents in securing the health of the crop. It appears, moreover, that not only are these substances necessary through the quantities which are present, but also through the relation which these substances bear to each other. It appears that the function of absorption is affected by one ratio, but the general development of the plant is dependent on a somewhat different ratio. It is hoped that through the employment of some novel and refined methods in this line of laboratory investigation information of great physiological and economic importance may be obtained and that the results will be capable of general application.

FERMENTATION INVESTIGATIONS.—The work of fermentation investigations during the past year has been confined chiefly to a study of the action of certain so-called oxidizing ferments, or enzymes, which bring about important changes in many technical products. It appears that these ferments are closely related to processes of respiration and are more or less closely connected with the development of plant pigments and other classes of products having commercial significance. Conspicuous in this line are such fermented products as black tea and vanilla pods as they appear on the market. These oxidizing enzymes are also likely under various conditions to produce a harmful action, as in the case of certain vegetable drugs which when exposed to the air deteriorate in value. An accurate method of measuring the activity of these ferments has long been wanted, and during the past year such a method has been worked out and is now being applied to practical technical problems.

PLANS FOR FUTURE WORK.

As the problems of the office largely consist of investigations requiring considerable time, work will be continued along the present lines.

DRUG PLANTS AND OTHER SPECIAL CROPS.—The usefulness of the small experimental cultures at the various testing gardens is being demonstrated in the results obtained, which have led to the expansion

of a number of plantings with the object of eventually reaching a commercial scale. It is hoped that this feature of the work can be extended to include points in eastern Texas and in the arid Southwest. This will make it possible to observe under suitable conditions important medicinal and related plants which are at present not grown in the United States. These testing gardens would be in position not only to carry on work with medicinal plants, but also to handle perfumery plants and volatile-oil plants, spice plants, tannin and dye plants, and other related crops.

The physiological work on lemons with special reference to the forced-curing process has developed important conditions which should be given a practical test on a commercial scale. It is desirable to make a cooperative arrangement with one or more lemon houses to install special experimental sweat rooms.

POISONOUS-PLANT INVESTIGATIONS.—Poisonous-plant investigations cover a wide field of study and in order not only to continue effectively the original investigations but also to give application to them it will be necessary to increase somewhat the now overtaxed facilities of the office. Owing to the limited help available for field and laboratory work it has been found difficult to give full effectiveness to the results already obtained.

CROP UTILIZATION.—Attention is once more called to an important line of work, at present to a considerable extent unappreciated, which has for its object the bringing together of the farm crop as produced by the grower and the special requirements of the consumer. The farm produces many crops which are crude materials for the manufacturer, and certain qualities in these crops are desired by the utilizer. Investigations concerned solely with the growing and production of the crop fall short of completing the work. It is important that investigators familiar with the agricultural aspects of the crops and also familiar in a technical way with the requirements of the manufacturers should aid in correlating agricultural activities with technical demands. The work of this office to a certain extent deals with problems of this nature, but there seems to be an opportunity for broadening this aspect of the work, to the great advantage of both farmer and manufacturer. In view of these facts such an amplification of the investigation in this direction is urged, the requirements for such an extension being the means wherewith to man and equip necessary special laboratories.

DENATURED ALCOHOL.—The attempt to make the production of denatured alcohol an isolated self-sustaining feature of American agriculture has thus far not succeeded. In Germany, where the greatest success has been achieved, alcohol production forms rather one feature in a system of diversified agriculture and is not attempted as a separate enterprise. It is highly desirable that the possibilities of alcohol production in mixed farming operations in this country should be investigated. Such an experiment must of necessity involve considerable expense and time and will probably be best undertaken in cooperation with organizations or individuals able to furnish effective help.

AGRICULTURAL-TECHNOLOGY INVESTIGATIONS.

The investigations of problems in agricultural technology, including cotton grading and paper-plant investigations, have continued under the direction of Dr. N. A. Cobb, assisted by Mr. Charles J. Brand, in charge of paper-plant investigations; Mr. W. E. Chambers and Mr. D. E. Earle, in cotton standardization; and by Dr. Albert Mann in general technological and microscopic work.

The appropriations made for the work conducted by the Office of Agricultural Technology, together with the state of its several projects, have made it necessary to devote the greater part of its energies to work connected with cotton standardization, paper-plant investigations, and the plant-attacking nematodes. The growth of the cotton work has necessitated the employment of additional expert and clerical assistants, while the cotton and nematode work has made it necessary to increase the force of laboratory aids from three to nine within the year. The premises have been further fitted for special work. All of the yard and area space has been roofed and converted into available working and storage space. Additional machinery has been installed for both the paper and cotton work, and the building formerly known as the denatured-alcohol plant has been taken over from the Bureau of Chemistry for use as storage space, for the installation of a cotton gin, and in preparation for a portion of the paper-plant work.

COTTON STANDARDIZATION.—Early in the year the preliminary distribution of the first sets of the official cotton grades for the purpose of familiarizing the cotton industry with the nature of these types was completed. Sets were placed with the principal cotton exchanges, with the members of the advisory committee, and with textile schools and agricultural colleges. The general sale of the grades was begun in September, since which time they have been supplied to all applicants upon payment of \$35. Seventy-nine sets were sold within the year, and the present year opens with a noticeably quickening demand for these types.

At the beginning of the year New Orleans was the only cotton exchange which had formally adopted the official grades as the basis of its operations. Within the year similar action has been taken by the exchanges at Memphis, Galveston, Mobile, Natchez, Little Rock, St. Louis, Charleston, and Macon. Several exchanges still have the question of the adoption of these grades under consideration. The types are now distributed to 22 States and have won the approval of all classes of people in the cotton industry as to the manner of their preparation.

A detailed card-record system has been devised which is designed to show the complete history of each set of grades sent out by the department. The geographical distribution is also recorded on skeleton maps.

As the permanence of the original standard is all important to the continued usefulness of the official grades, the work of preserving a sufficient number of these types in vacuum storage to serve as standards for many years to come has been actively pushed. Fifty sets have been most carefully prepared by our experts, assisted by experts from the New York and New Orleans exchanges, and the work

of actually inclosing the types in glass tubes is rapidly progressing. The final operation of evacuating and fusing off will follow in the immediate future.

Several demonstrations of the practical usefulness of our method for accurately determining the length of staple of cotton have been made within the past year, and great interest is shown by all those engaged in the industry who have seen this method, which has most important applications in every part of the cotton industry.

(1) It is of use to the breeder of cotton, since it permits a study to be made of the relative proportions of long and short fiber on individual seeds and on the various portions of the same seed. It also enables a more accurate estimate to be made of the staple of a given plant or a given seed.

(2) It is now possible for the first time to say definitely what effect ginning has on the length of staple. By taking a carefully picked sample of cotton and running it through the gin at different speeds and in different ways it is possible by measuring the staple to ascertain the optimum conditions for staple. A comparison of these results with the output of the gin will enable the operator to select such speeds and other factors as may best meet these conditions.

(3) When the cotton becomes an article of commerce, the length and evenness of its staple are the factors that above all others determine its value for spinning purposes. Hitherto the methods of making these determinations have been very crude. It has not yet been possible to accomplish this accurate stapling at a price that will admit of its application to a single bale of cotton, but the price is being constantly reduced and the time is probably not far distant when it will be so cheap that it may be applied in a good many of the ordinary transactions in cotton. Meanwhile, this accurate method of stapling is a means for standardizing the rougher methods that prevail in this respect. A study has been made of the methods of high-class experts in all branches of the industry with a result showing that on an average experts do not estimate within an eighth of an inch of the actual length of the staple. They nearly all estimate too high, but do not show any uniformity in this respect. In important arbitration cases, this method of stapling will be of great value. Instances of this are believed already to have arisen.

(4) Accurate measurement of the staple has an important application in the spinning of cotton. Machines are adjusted to handle a given length of staple and it is important that they be supplied with cotton suitable to their adjustment. It is also important to know whether the adjustment marks on machines are what they pretend to be. Hitherto there has been no certainty of determining either of these points with accuracy.

(5) A matter of very great importance is the quantity of good spinnable fiber lost in the waste from the mills. Here again there has been no accurate means of determining how much spinnable fiber is left in the waste. Examinations have been made during the year of a number of wastes with very striking results. This method can undoubtedly be made the means of a more careful adjustment of machinery so as to save valuable fiber which now goes into the waste.

An application of this method of stapling is being made in the interests of cotton growers. A good chance to improve the quality

of the growers' product through improvement in ginning is undoubtedly opened up. It has been determined to institute speed tests on saw gins, the idea being that as saw gins are used to gin the bulk of the cotton crop it is of fundamental importance to know exactly the effect of different speeds, etc., on the length of the staple. These speed tests will be followed by others relating to the form of the teeth and other details of the machine.

Preparatory to undertaking the ginning tests a lot of 1,000 pounds of specially picked long-staple cotton and a similar lot of Upland cotton were obtained. A 60-saw standard-driven gin was purchased and installed in the building formerly used as a denatured-alcohol plant. The gin was selected as representing a type widely used and best calculated to give results which will be intelligible to the greatest number of cotton growers. With the aid of the devices for accurate measurement of length of cotton staple a detailed study is being made of the effect upon the fiber of running the gin at various speeds. Other factors which influence the action of the gin on the cotton will be taken up for investigation as opportunity is presented.

An effort is being made to standardize and record the color of cotton samples by means of several known colorimeters, by the use of combinations of dry colors, mineral fibers, tinted tile, and other devices. Within the past year much correspondence and investigational work has been carried on in connection with this effort.

PAPER-PLANT INVESTIGATIONS.—The most important work of the year in connection with the investigations of crop plants which may be used for paper making has been in the practical testing of the value of a food extract which is obtained from cornstalks as a preliminary to their conversion into paper pulp. Preliminary experiments have shown that corn, broom corn, and rice straw yield under hot-water extraction almost the entire nutritive value of the dry material. Feeding tests conducted by the Bureau of Animal Industry with two animals early in the year indicated that the food extract thus obtained contained no poisonous substance and produced no injurious effects. As the practicability of utilizing cornstalks for paper making is closely connected with the value of the by-products which are obtained, arrangements were made to produce the food extract in sufficient quantity to conduct a more conclusive test as to its value for use with different classes of animals. Funds for this work were not available until late in the winter, but Mr. C. J. Brand, of this office, succeeded in installing a plant in Chicago, Ill., when enough extract was produced to conduct a feeding test of one month with a herd of 20 dairy cattle. This test was conducted by officers of the Bureau of Animal Industry. The report of the Dairy Division of that bureau shows that the extract had a considerable feeding value, but as the test was made at the very end of the stall-feeding period and the animals were kept from pasture two or three weeks beyond the usual time in order that the test might be completed, it is believed that the results are less favorable than they would have been if the test had been made earlier in the winter. The work was also handicapped by the quality and quantity of material for extraction which was available at that season of the year. The extract actually used in this feeding test was inferior in quality to that which has been produced in earlier and in succeeding experiments.

A test of this same extract made with hogs by the Bureau of Animal Industry at the experiment farm at Beltsville, Md., indicated a much higher feeding value.

The results of these two feeding tests appear so encouraging that plans are being made to produce a larger quantity of extract this year from material harvested at the time which appears to be most favorable for both extract and fiber production.

As a result of the work on other materials conducted at Cumberland Mills, Me., it may be stated that broom-corn stalks have been shown to be an immediately available material for paper making. A large assortment of materials has been collected for experimental work during the coming year and a quantity of finished paper has been produced from several classes of crop waste handled both alone and in combination with varying percentages of wood pulp. The practical value of these papers for book purposes has been tested by the use of five kinds in a circular of the bureau series. Considerable additions have been made to the paper-making machinery in Washington.

In connection with the paper project a large number of materials are being examined by Dr. Albert Mann, who is making careful measurements of the fibers of various wild plants and a study of the relative proportions of various classes of tissue in the hope of finding an exceedingly fine fiber which can be used for plating paper made from coarser vegetable fiber, thus decreasing the amount of foreign matter which is now used to give a smooth surface to book papers. These studies have other important objects.

CROP TECHNOLOGY.—Owing to the very limited funds available, it has been impossible to prosecute very actively the various projects under the general head of crop technology, and attention has been chiefly given to one of the miscellaneous projects, the study of plant-attacking nematodes. A great variety of material has been sent to this office within the past year for examination, and the investigations indicate that the injurious species of nematodes are very widely distributed and highly injurious, especially in the Southern States.

Studies have been undertaken to determine the normal nematode population of certain classes of soils and of soils the crop history of which is definitely known. By this means it is hoped to learn the effect of certain systems of cropping upon the most common and injurious species. A large number of soil samples from the Arlington Experimental Farm have been examined, and collections are being secured from abroad for comparison with native species.

The constantly increasing importance and widening scope of this work demand a larger expenditure of time and energy each year.

ILLUSTRATION AND PROJECTION.—Further improvements and adaptation of projection methods in the measurement of cotton and paper fibers have been worked out, and the value of the solar projector for illustration has been further demonstrated. Improvements have been made in the use of the camera lucida, and a study of screens has resulted in the preparation of an aluminum-covered screen which is considered an improvement for projection work.

STUDIES OF PLANT FIBERS.

In the investigations of plant fibers, in charge of Mr. Lyster H. Dewey, special attention has been given to hemp, flax, sisal, and zapupe, products represented by importations averaging \$16,000,000 annually, a large proportion of which could be produced with profit in our own country.

HEMP INVESTIGATIONS.—Experiments in growing hemp on the State farms in Wisconsin, in cooperation with the Wisconsin Agricultural Experiment Station, have been continued with gratifying results. This hemp has been pronounced superior to any grown in Kentucky in many years. The fertile soil in Wisconsin produces a uniform growth of stalks with a very thin woody shell and consequently a larger percentage of fiber. The stalks in Kentucky are more woody and therefore more difficult to ret properly and much more difficult to break. Since the success of these experiments depends largely upon the development of suitable machinery for preparing hemp fiber, various types of hemp brakes are being tested. There seems to be ample ground for the belief that when this feature of the problem has been solved hemp will prove a valuable addition to crop rotation in Wisconsin. The success attained in the experiments thus far has been sufficiently encouraging to warrant farmers in enlarging the area devoted to this crop.

Experiments with hemp which were undertaken last year at several places in Iowa in connection with the Iowa Agricultural Experiment Station have given promise of satisfactory results. Work on the development of improved varieties is being continued with considerable success.

FLAX INVESTIGATIONS.—The continued careful selection by scientific methods of flax plants of superior types grown for the production of fiber under close observation in nursery plats in eastern Michigan has yielded large quantities of valuable material for propagation. A setback has been encountered in the wilt which has attacked a number of the experimental plats during the past summer. While this difficulty is a serious one, it furnishes an opportunity for experiments in the development of wilt-resistant types, a phase of the work which has been undertaken in the hope of obtaining satisfactory results in this direction during the coming season.

Satisfactory results are being obtained in the work under way in Minnesota and adjacent States for the selection of flax plants with a view to the adaptation of improved and uniform varieties grown for seed, special attention being given to the increased production of flaxseed to meet the urgent need for this commodity in the manufacture of linseed oil.

SISAL AND OTHER HARD FIBERS.—Experiments in the cultivation of sisal, henequen, and zapupe near Yauco, P. R., carried on in cooperation with the Porto Rico Agricultural Experiment Station, have given excellent results in the growth of the plants. In order to avoid the mistake of cutting leaves too soon, thus injuring the plants, it has been decided to postpone harvesting leaves for the first crop of fiber until the coming season, when a larger number will be available.

The cooperative experimental plantings of sisal, cabuya blanca from Costa Rica, and two varieties of zapupe from eastern Mexico,

undertaken last year on Sugar Loaf Key, Fla., are being continued with promise of a successful outcome. During the fall of 1910 these experiments sustained considerable damage from hurricanes; nevertheless, a large proportion of the plants withstood the conditions, the growth made by the sisal plants being especially encouraging.

PLANS FOR FUTURE WORK.—In order to obtain the results expected from the experiments now in progress, plans are being made for the continuation of the work along the general lines already under way, as follows:

(1) The extension of cooperative hemp work, encouraging its cultivation over a wider area; (2) the further investigation of hemp machinery with a view to reducing the cost of handling the crop; (3) the breeding of flax of improved fiber and better seed varieties, with special attention to soil and climatic effects; and (4) the further introduction of fiber-producing agaves and other hard-fiber plants through investigation in Mexico of the varieties found to be most promising for cultivation in this country.

TAXONOMIC AND RANGE INVESTIGATIONS.

The taxonomic and range investigations have continued under the direction of Mr. F. V. Coville.

DOMESTICATION OF THE BLUEBERRY.—The results of the experiments on the domestication of the blueberry have been published. The most important point remaining to be determined before blueberry culture could be definitely recommended as an agricultural industry was the return from a blueberry plantation in actual productive operation. Several years would have been required to secure this information experimentally. One of the results of publication, however, was to bring to the knowledge of the department the actual existence of a blueberry plantation near Elkhart, Ind., more than 20 years old. This plantation, which was examined during the past year, was established about 1889 on a piece of sandy bog land containing wild blueberry plants. This bog the owner drained, cleared of brush, and set with wild blueberry plants of bearing age. The plants were procured from large swamps in southern Michigan. They were set in rows at a distance of 8 feet each way and were kept clear of all other growth by shallow cultivation supplemented by hand weeding. The plantation has been very productive and profitable, the net profits this year being a little more than \$160 per acre. Exact records for the earlier years are not in existence.

IMPROVEMENT OF FOREST GRAZING AREAS.—The experiments in the National Forests in the use of coyote-proof fences for the pasturage of sheep and for lambing inclosures, improvements in the methods of handling sheep so as to utilize the forage in the most effective and least injurious manner, studies of the methods of natural reseeding of destructively overgrazed ranges, and of artificial reseeding are all producing results of great importance in their bearing on the conservation and development of the grazing resources of the National Forests and of other range lands as well.

Taxonomic studies of cultivated and other economic plants are progressing, with special reference to the needs of other branches of

the bureau and of the department. A special study of the American wild plum, which will be useful in all horticultural work on these fruits, is now approaching completion.

Studies in the classification of North American grasses are putting our taxonomic knowledge of this important group of plants on such a basis as to be useful to grazing interests throughout the country.

SEED-TESTING LABORATORIES.

The work of the seed-testing laboratories has been continued as formerly under the immediate charge of Mr. Edgar Brown. Routine seed testing has been carried on as in previous years at the Washington laboratory, as well as at each of the five branch laboratories located in North Carolina, Oregon, Nebraska, Indiana, and Missouri. Each of the laboratories has shown an increase in the number of samples of seed received due to two direct causes, a wider interest in good seed and the passage of seed laws by several States. The Washington laboratory has continued its investigation, studying the distinguishing characters of the seeds of closely allied groups of plants and improving the methods of germination, paying special attention to the hard seeds and methods of treatment to obtain an immediate germination.

The examination of forage-crop seeds to detect the presence of adulterants has continued with the very gratifying result that very few samples of the kinds collected in former years were found to be adulterated. Redtop seed, collected last year for the first time, however, was found badly mixed with timothy.

On June 30, 1911, the Washington laboratory discontinued its connection with the laboratories in North Carolina and Nebraska, as these stations are now in a position to continue the work. During the fiscal year ending in 1912 it is expected that two new branch laboratories will be opened in States where little attention has thus far been paid to the work.

The future work of the laboratory will follow the lines of the past. The Washington laboratory is making no effort to increase the number of routine tests, but is endeavoring to create an interest in seed testing at the State agricultural experiment stations and also to furnish any assistance possible to stations taking up the work. With this end in view all the attention possible is being turned toward the extension of investigation work.

GRAIN STANDARDIZATION.

The grain-standardization investigations, comprising a study of the harvesting, handling, storing, and transporting of grain in so far as these factors have a bearing on milling and feeding values and commercial grades, have been under the immediate supervision of Dr. J. W. T. Duvel. In order to facilitate these investigations, laboratories have been maintained at Chicago, Ill., in charge of Mr. W. P. Carroll; at Decatur, Ill., in charge of Mr. C. A. Russell; at Fargo, N. Dak., in charge of Mr. Clyde H. Bailey; at Kansas City, Mo., in charge of Mr. E. L. Morris; at New Orleans, La., in charge of Mr. L. M. Jeffers; at Baltimore, Md., in charge of Mr. Laurel Duval; with field stations at Columbus, Nebr., and Coffeyville, Kans.

TRANSPORTATION AND STORAGE INVESTIGATIONS.—Good progress has been made in determining the changes which took place in grain while in transit or in storage, special attention having been given to the rate and degree of deterioration and to shrinkage as influenced by moisture content, soundness, climatic conditions, etc. The results of three special experimental shipments of four cars each from Baltimore to Chicago and return show that there is an appreciable "natural shrinkage" in corn during transit in cars, the amount of shrinkage depending largely on the quality and condition of the grain and the temperature and humidity of the atmosphere. Similar results were also secured on several 500-bushel lots of shelled corn stored in the hoppers of large elevator scales, the grain in each case being held until it showed distinct signs of going out of condition. Additional storage tests were likewise made with several lots of grain representing different grades, the results almost invariably showing that the rate of deterioration increases as moisture content increases. Special attention was also given to American export corn, five cargoes, representing more than a million bushels, being accompanied to European ports, observations being made during transit, with careful comparisons and analyses, to show the relative condition of the corn at the time of loading and at the time of discharge. Definite temperature records were also secured on two additional cargoes, and samples were taken from numerous miscellaneous cargoes at the time of discharge in European ports. The results of this work show that the condition of the grain at the time of loading and the place of stowage on the ship are the principal factors in determining the degree of deterioration.

GRAIN HANDLING AND MILLING INVESTIGATIONS.—In all of the outside laboratories a large number of samples have been analyzed for the grain trade. Milling work in cooperation with the North Dakota Agricultural Experiment Station has been continued, and milling tests have been made on a large number of samples relating to different classes, varieties, and commercial grades of wheat as a basis for standard grades; also on samples containing various known quantities of different kinds of damaged kernels and on samples containing known quantities of various kinds of weed seeds, known in grading as "dockage," in order to determine the effect of these mixtures on the relative values of the wheat. Considerable work has been done to show the effect on grade and commercial value of farm methods of harvesting and handling grain; the handling and grading of grain in both country and terminal markets have been studied; preliminary investigations have been carried on concerning the drying of corn in commercial driers, and the bleaching of low-grade oats has been investigated and the results of the investigations published. Preliminary work has been done to determine the fundamental causes responsible for the deterioration of commercial grain, the effect of biochemical changes which take place after harvesting and during storage, and the changes in the chemical composition of grain during deterioration.

PLANS FOR FUTURE WORK.—During the ensuing fiscal year work will be carried on along similar lines and will be extended to include the study of the methods of handling and grading wheat in the States of Washington, Oregon, Idaho, Montana, and California,

and the methods of handling, marketing, and grading rice in Louisiana, Texas, Arkansas, and South Carolina.

During the fiscal year ending June 30, 1913, it is planned to extend very materially the investigations on rice and to take up the commercial grading and handling of kafir.

GRAIN INVESTIGATIONS.

The general adaptation, breeding, and other work on grains has continued under the immediate charge of Mr. M. A. Carleton.

WINTER-WHEAT EXTENSION.—Experiments with winter wheat continue to give good results, and the area devoted to winter-wheat growing has been extended considerably to the north and west by the use of hardier strains, such as the Kharkof. The annual production of this variety alone in the United States is now about 20,000,000 bushels. Especially interesting results have been obtained the past year in the Judith Basin of Montana and in eastern Oregon. A circular discussing winter wheat for western South Dakota has been issued.

DURUM WHEAT.—The most important feature in relation to durum wheat is the recent considerable increase in its use in this country. The exports are not now so large, indicating that with an annual production about the same as heretofore much more of this wheat is being used at home. In addition to its use for bread making it is now being employed much more extensively in the manufacture of breakfast foods. A number of such foods are made largely from durum wheat, and one of the most prominent breakfast-food companies in the United States is now using this wheat entirely.

Experiments have been continued with some promise of success with the purpose of producing a winter variety. Through hybridization new strains have also been developed that are beardless, an important character for the farmer.

OTHER CROPS IN ROTATION WITH CEREALS.—In addition to the usual success obtained with cereals following other crops, such as legumes and rye plowed under green, especially interesting results were noted at Chico, Cal. Land which had been cropped for three years with alfalfa (1907–1909) and on which corn was grown in 1910 was sown with Chul wheat following the corn and in 1911 gave a yield of 87 bushels per acre. The same wheat sown on ground that had been continuously cropped with grain for three years produced 30 bushels per acre.

INFLUENCE OF ENVIRONMENT ON THE COMPOSITION OF GRAIN.—Several new experiments to determine the influence of environment have been started the past season. In all experiments of this kind undertaken recently only pedigreed seed is being used—that is, seed that has been increased from a single mother plant, so that the most accurate results possible may be obtained. Results continue to show a greater influence of climate than of soil on the composition of the transferred seed.

TIME AND RATE OF SEEDING GRAIN.—Most of the experiments relating to the time and rate of seeding grain indicate that the best rate of seeding is a little less in every locality than that which is commonly

practiced and that the date of fall seeding in many localities should be a little later than that generally chosen.

WINTER EMMER.—Recent investigations of winter emmer have shown the important fact that it may be much improved in hardiness. A particular strain has been developed from a few plants surviving the winter several years ago in northern Wyoming which has remained completely winter resistant, though during the winter of 1909-10 the temperature fell to -20° F. It now remains to be determined whether this improved strain will survive in the same latitude east of the Rocky Mountains.

The value of emmer as a drought-resistant feeding crop is becoming realized, and much popular interest in winter varieties has been awakened. Some very good results with Black Winter emmer have been obtained at the experiment farms.

EXPERIMENTS WITH PROSO.—Particular attention has been given to experiments with the large-seeded Russian millet correctly known as proso. The indications are that this crop will succeed under conditions and in localities heretofore unsuspected. Particularly good results were obtained under irrigation at Huntley, Mont., in cooperation with the Office of Western Agricultural Extension. However, at the same place the same varieties were also very successful under dry-farming methods. Proso has done well at almost all northwestern experiment farms. The Black Voronezh variety is uniformly the best.

DRY-LAND GRAIN INVESTIGATIONS.—The extremely severe drought in the Great Plains, from western North Dakota to western Oklahoma, has given an unusual opportunity the past season for showing the superiority of drought-resistant cereals. The hard winter wheats have done especially well in comparison with the softer varieties, while the Swedish Select oat, the Ghirka spring wheat, and several varieties of barley have shown much superiority over other less resistant cereals. The number of experiments to determine the best time and rate of seeding dry-land grains and the best methods of cultivation have been considerably increased. New grain-experiment farms have been established in cooperation with the State stations at Downey, Idaho, and Burns, Oreg.

OAT INVESTIGATIONS.—Experiments for the purpose of developing hardier winter varieties of oats have been continued with still better results. Progress has been made in the development of new strains intended to resist lodging. In hybrids of Sixty-Day and Kherson oats with other varieties several strains appear to be smut resistant; some also appear to be more resistant to rust than other varieties.

The Swedish Select oat, introduced by this department, continues to show its good qualities in the Northern States, about five-eighths of the total crop of Wisconsin, or 50,000,000 bushels annually, being of this variety. The Sixty-Day, another introduction, has done equally well in other portions of the country.

BARLEY INVESTIGATIONS.—Investigations of barley are conducted under the immediate direction of H. B. Derr and Harry V. Harlan. Experiments with Arlington, the new awnless winter barley, have progressed with considerable success. Seed of this hybrid has been

sent to all of the State experiment stations in the South and West where winter barley would be likely to succeed and excellent results have been reported from many localities. Owing to its high stooling qualities this variety gives promise of being very productive.

From about 60 different forms of pedigreed barley sown at each of five points in the North and West some interesting facts were learned, but particularly at the cooperative experiment farm at Moccasin, Mont. In one group every selection was promising, the six strains all possessing characters in common.

About 400 pedigreed strains and several hundred hybrids are under experiment at St. Paul, Minn., in cooperation with the State station. The Swan Neck variety is gradually becoming acclimated and did especially well the past year in Minnesota. From a hybrid of the South African crossed with the Manchuria variety results have been obtained showing a striking reversion to ancestral characters.

GRAIN-SORGHUM INVESTIGATIONS.—The work with the dry-land grain-sorghum crops has been continued under the immediate charge of Mr. Carleton R. Ball. The season of 1910 was a severe one in much of the grain-sorghum belt. Such a condition following the drought of 1909 enabled the new dwarf and early strains to show their superiority over the taller and later sorts. In spite of the intense drought the yields were larger than in 1909, due to thinner stands, which emphasizes the need of insuring against crop loss from drought by planting thinly each year a part of the area grown in these crops. Improved strains distributed by this bureau produced the only crops grown by many new settlers in the Southwest.

RICE INVESTIGATIONS.—The rice investigations under the direction of Mr. C. E. Chambliss have continued along lines already projected. In the Louisiana investigations much progress has been made in solving the problem of controlling red rice largely through proper crop rotations and thorough cultivation. During the year experiments with rice have been permanently established at Beaumont, Tex., where the investigations will be similar to those in Louisiana. In California experiments are being conducted at nine different points. Some unusually good results have been obtained. The results of investigations in Florida indicate that success may be obtained in rice cultivation without irrigation on the prairies now being settled.

CEREAL DISEASES.—In the cereal disease work in charge of Mr. Edward C. Johnson studies of the life history of rust have been continued. Several resistant hybrids adapted to Minnesota conditions have been established and the seed is being increased. Experiments for the purpose of improving methods in this type of breeding are in progress.

It has been demonstrated that the head smut of sorghum is not caused by external inoculation of the seed, as in stinking smut of wheat, or by local infection, as in corn smut, but is similar to that of the loose smuts of barley and wheat; that is, by infection at an early stage in the plant's life.

Rice diseases are being studied, particularly "straight head," which caused losses of 50 to 75 per cent of the crop on many plantations in Arkansas, Louisiana, and Texas in 1910.

A special study has been commenced to determine the relations of the imperfect fungi in the soil and air to deterioration in yields of grain, the results of which should throw some light on soil-fertility problems and questions of crop rotations.

PACIFIC COAST INVESTIGATIONS.—In the investigations on the Pacific coast, under the direction of Mr. H. F. Blanchard, the Chul and Fretes varieties of wheat continue to make a better showing in yield than others commonly sown. Chul wheat yielded at the rate of 87 bushels per acre; Fretes, 76 bushels, and the common variety, White Australian, 60 bushels. All varieties made comparatively high yields.

In the time-of-planting experiments it was found that on well-tilled soil December 15 is a better time for planting than November 1 to 15. The December planting gave as high a yield and a better quality of grain.

INVESTIGATIONS IN THE SOUTHERN STATES.—A rather thorough preliminary survey of conditions in the Southern States shows not only an increasing interest in the cultivation of grains, but also indicates the possibility of much improvement in varieties, methods of cultivation, rotations with other crops, the use of fertilizers, etc. Experiments are being undertaken in cooperation with State stations, as far as funds permit, to determine means of improvement in these conditions.

PLANS FOR THE NEXT FISCAL YEAR.—In addition to the continuation of ordinary lines of work the following subjects will be given special attention: More attention than heretofore will be given to the determination of the best crops to grow in alternation with cereals and to methods of cultivation. Further experiments will be conducted to determine the adaptation of varieties of proso (millet) to different sections and the best methods of handling the crop. In the investigations of durum wheat, kafir, and durra sorghums further tests of the flour from these grains for use as human food will be made. The value of winter rye and buckwheat in localities where these cereals are not now grown to any considerable extent will be determined. Considerable time will be given to the development of hardier winter strains of oats and barley. An important line of experiments will be undertaken with broom corn, and special attention will be given to the matter of the adaptation of kowliang sorghums to new areas. Rice experiments will be continued in California, and further work will be undertaken in Arkansas and Florida, if funds available permit.

In cereal diseases further investigation will be made of the methods of preventing smuts of the small grains. The relation of imperfect fungi in the soil to deterioration in the yields of grains will be studied, further studies will be made of the sorghum smuts, and an effort will be made to obtain additional information on the life history of rusts.

Experiments will be undertaken to determine the varieties of cereals best adapted to the South, the proper rotations of other crops, and the best methods of cultivation.

CORN INVESTIGATIONS.

The work of the Office of Corn Investigations has continued under the direction of C. P. Hartley, with Ernest B. Brown, Curtis H. Kyle, L. L. Zook, and J. G. Willier in charge of field investigations

at series of points ranging from the southern to the northern portions of the United States. This arrangement insures a broad knowledge of the crop as affected by environment, and it also affords opportunity for each investigator to give personal attention to field experiments for almost the entire year. Better and more profitable corn crops is the object of this work, which is conducted with and for the farmer. By farmers who have observed the results of these investigations the work is highly appreciated, and applications for conducting cooperative corn work are largely from localities where experiments have been conducted. In each locality in which the best varieties and methods of breeding, seed preservation, and culture have been investigated, the yield and farmers' profits have been increased.

SUMMARY OF THE YEAR'S WORK.

The various lines of cooperative corn work have given both immediate and far-reaching results of great value. The breeding work and lines of special investigation conducted with breeders and growers bring the bureau in closest touch with the farmer, while the cooperative assistance rendered to corn improvers' associations, boys' corn clubs, industrial schools, and farmers' clubs gives the results of the investigations a much wider application than would otherwise be possible.

ORGANIZATION OF CORN-TESTING CLUBS.—By the organization of local clubs to test the productiveness and adaptation of varieties, demonstrations of much value are made possible at small cost. The organization of such clubs and of boys' competitive corn-growing clubs is strongly encouraged, and suggestions, record forms, and, wherever practicable, seed of some varieties for such tests are furnished.

COOPERATION WITH CORN BREEDERS.—Some of the high-yielding strains of corn described in last year's report and which have been improved by cooperative work with local corn breeders are now being grown and disseminated by a sufficient number of breeders to insure their distribution throughout districts to which they are adapted. In many localities in which it has not been possible for the bureau to attend to breeding work, sufficient assistance has been given local breeders to create an interest in corn improvement throughout the community.

EASY PROFITS FROM SEED PRESERVATION.—Last year extensive tests conducted by cooperators and accurate tests by the bureau showed that good seed preservation increased production to the extent of 5 bushels to the acre. The results are similar to those of other seasons in other localities and demonstrate that as a savings bank the seed-corn rack returns a large interest upon the investment. They also show that the effects of temperature and moisture upon dormant seed corn need further investigation.

CROSSBREEDING CORN.—The influence on yield of crossbreeding certain varieties is set forth in a recent bulletin, which covers the work of two years in four States. Of many first-generation crosses made and tested a few have proved much more productive than either parent.

ADAPTABILITY OF CORN.—Each succeeding year's work more and more reveals the great adaptability of maize. In previous reports mention has been made of two series of five-year tests, which show that the relative productiveness of a variety in a given locality depends upon the location in which the variety has been previously cultivated. The past year's tests show that the growing of a variety for but four years in a new locality may cause it to become much more productive there and much less productive in the original locality than the original seed. Varieties from Mexico and South America when grown in the different sections of this country not only assume an appearance and productiveness unlike that which they exhibit in their native habitat, but assume different appearances in different parts of this country. This variation induced by change of environment affords good opportunities for selection. Very profitable strains are being produced in this way and by cross-breeding.

OUTLINE OF WORK NOW IN PROGRESS.

WORK IN THE CORN BELT.—The cooperative work arranged with local breeders, corn breeders' associations, and cooperative corn clubs is more extensive than last year. Investigations of methods of breeding, planting, and cultivating, of effects of cover crops and crop rotation, and of methods of preserving seed corn are in progress. At the points where strains are being bred for increased productiveness these strains are being tested in comparison with many local and introduced varieties, and about 500 cooperative variety tests are in progress. Crossbred seed like that which last year proved much more productive than either parent is being produced in considerable quantity in order that its productiveness may be extensively tested by cooperators.

WORK OUTSIDE OF THE CORN BELT.—In many sections where the requirements for good corn crops are not understood, and where varieties and their adaptation are not considered, suggestions and demonstrations made by the experts of the bureau are of special value and greatly appreciated by those who find it advisable to grow corn. There are reclaimed swamps, deltas, and everglades that give promise of producing good corn crops as soon as adapted varieties, the best planting time, and the most practical methods of culture are determined. There are many localities in the mountains and in districts recently brought under irrigation where corn is not an article of commerce, but where it is much needed, and where present attempts at corn culture could be made doubly as profitable as at present. Because of the good results and appreciation which have followed the work outside the corn belt, as much is being done as the funds and force will permit.

PLANS FOR FUTURE WORK.

The work of breeding higher yielding strains of corn and of testing their productiveness in comparison with local varieties and crosses has been shown to be of such great value in the few localities in which it has been conducted, and is so certain to bring results of profit to the farmer that plans have been made for an extension of

this work into such districts as are poorly supplied with reliable and productive varieties. The field tests recently conducted by county corn improvers and breeders' associations in cooperation with the bureau have proved that such organized tests attended with public observations and field-day exercises are of more profit to a community than very many tests by individual farmers with opportunity for few to observe. Plans are being made to give all possible assistance to these tests and of organizing competitive corn-improvement clubs with awards to those increasing the producing power of their corn most rapidly. Plans are also under consideration for making every corn farmer as fully aware of the profits of seed-corn preservation as are those who have built seed-corn houses and thereby increased their crop enough in one year to pay several times the expense of building.

Important problems that can be solved by well-planned investigations each year financially affect every corn grower. Since it has been demonstrated that the degree of dryness and of temperature at which seed corn is held during the winter greatly influences its productiveness, it is very important to determine the exact conditions that result in highest productiveness. By proper investigation other first-generation crosses can be discovered which, like U. S. Cross No. 182, will prove of very great value in certain localities, and plans and methods for discovering such crosses and demonstrating their superiority have been adopted for various districts. Plans are made to extend the investigations of the insect-resistant, disease-resistant, and drought-resistant characters of corn and to determine the most practicable substances for preventing insect and fungous destruction of germinating seed corn.

TOBACCO INVESTIGATIONS.

GENERAL FEATURES OF THE INVESTIGATIONS.

The tobacco investigations of the bureau in charge of Dr. W. W. Garner have been continued largely along the lines followed in the past, although some additional problems of importance have been taken up. Experiments and demonstrations have been carried out in the more important tobacco districts of the States of Massachusetts, Connecticut, New York, Pennsylvania, Ohio, Kentucky, Maryland, Virginia, North Carolina, South Carolina, and Texas.

The more general features of the work are the improvement in yield and quality by breeding and selection combined with systematic variety tests, the determination of the plant-food requirements of the crop in the various tobacco districts, and the development of the best systems of crop rotation applicable to tobacco culture. Some or all of these problems have been taken up in each of the States mentioned and while in every case the work is shaped to meet local requirements the results will afford a sound basis for developing improved methods of tobacco culture of more or less general applicability. Special laboratory and field investigations relating to curing, fermentation, the control of diseases, etc., are taken up in those districts where most needed.

For the purposes of sound and effective practical demonstrations in improved methods it is recognized that, because of the fact that the

tobacco industry is based on a number of characteristic types, each requiring special methods of production, the demonstrations must be based on local experiment. To meet this requirement field stations are maintained in the principal tobacco districts and the experimental data obtained are utilized in conducting the demonstrations illustrative of the most profitable methods of tobacco culture.

As a counterpart to the breeding investigations which have been in progress for several years, experiments have been taken up this year with pure strains of several characteristic varieties of tobacco for the purpose of making a systematic study of the effects of environment on the habits of growth of the plant and on the quality of the cured leaf.

INVESTIGATIONS IN CIGAR-TOBACCO DISTRICTS.

WORK IN THE CONNECTICUT VALLEY.—Cooperative studies with growers as to the value of the steam sterilization of seed beds in controlling calico or the mosaic disease have been continued, as have also the tests with different sources of phosphorus in increasing the yield and reducing rust in the broadleaf section. The special feature of the investigations in tobacco curing in this section this year is a study of the effect of different temperatures on the color and other qualities of the cured leaf.

WORK IN NEW YORK.—Experiments in the most profitable use of fertilizers and the best systems of crop rotation adapted to tobacco culture are in progress in both the Onondaga and the Big Flats districts. The Haynes type of filler tobacco as improved by the bureau is proving very satisfactory in the Onondaga district.

WORK IN PENNSYLVANIA AND OHIO.—The work in Pennsylvania, which at present is confined to Lancaster County, consists in the improvement in yield and in uniformity of the filler types by breeding and selection. A detailed study with respect to yield is being made of selected strains of Pennsylvania Broadleaf. In Ohio cooperative tests with growers are being made of several promising hybrids adapted for filler purposes and these are being introduced to the trade.

WORK IN TEXAS.—The demonstrations of the best methods of fertilizing and the best systems of crop rotation adapted to the growing of filler tobacco from Cuban seed which were begun last year at Nacogdoches in cooperation with the State experiment station are being continued this season. Comparative tests of several desirable varieties of filler tobacco are also being made.

INVESTIGATIONS IN MANUFACTURING AND EXPORT TOBACCO DISTRICTS.

Investigations are in progress this year in Maryland, in the Burley and Hopkinsville districts of Kentucky, in the sun-cured, the fire-cured, and the flue-cured districts of Virginia, in the "old belt" of North Carolina, and in the "new belt" of North Carolina and South Carolina. The average yield of tobacco per acre, owing primarily to depletion of the supply of humus in the soils, is far less than it should be in most of these districts. The problem of introducing legumes into tobacco rotations, which offers some difficulty because of the effect of these crops on the quality of the tobacco, is receiving special attention this year in Maryland and the Carolinas.

WORK IN KENTUCKY AND MARYLAND.—The study of the comparative value of several strains and varieties of Burley tobacco and of the fire-cured types is being continued at Lexington and Hopkinsville in Kentucky. Tests are being made at Hopkinsville to determine the best available source of phosphorus for the tobacco crop. In Maryland the prolonged drought has made it impossible to carry out certain features of the investigations this year, but the fertilizer experiments are being continued and special tests as to the possibility of utilizing cowpeas, crimson clover, and vetch in improving the tobacco lands without injuring the quality of the tobacco have been taken up.

WORK IN VIRGINIA.—A change in the plan of conducting the cooperative tobacco experiments in Virginia has been made, whereby the management of the local stations in the several tobacco districts is left in the hands of the State experiment stations, while the supervision of the tobacco work at these stations remains with the bureau. The experiments and demonstrations are being continued along practically the same lines as in the past.

WORK IN NORTH CAROLINA AND SOUTH CAROLINA.—Owing to the largely increased appropriation of the State in support of the work the investigations in North Carolina have been very much extended this year, and experiments are now in progress in each of the three sections of the State producing different modifications of the flue-cured type. The various local types and strains of tobacco are being given comparative tests as to yield and quality of leaf produced and two new hybrids are being developed to secure increased yields. Fertilizer tests and crop-rotation studies with special reference to the use of cowpeas and crimson clover as soil improvers are in progress at each of the three local stations. It is planned to utilize the experimental data thus obtained as rapidly as available in making practical demonstrations in cooperation with leading growers in improved methods of tobacco production.

Experiments in improved methods of flue curing have been taken up and investigations looking to the control of the Granville wilt have been continued in Granville County, these features of the work being conducted in cooperation with the State station.

The work in South Carolina, which is located in Florence and Clarendon Counties, is along essentially the same lines as in North Carolina and includes tobacco breeding and variety tests, fertilizer experiments, and crop-rotation studies.

PLANT-NUTRITION INVESTIGATIONS.

The investigations in charge of Dr. W. W. Garner relating to some of the fundamental problems in plant nutrition of a general nature have been continued along the same lines as last year. The work includes laboratory studies and field experiments under varying soil and climatic conditions, the facilities at the Arlington Experimental Farm being utilized as far as practicable.

RELATION OF NUTRITION TO THE CHARACTER AND COMPOSITION OF THE PLANT.—The specific influence of the various elements of plant food on the production of the valuable constituents of agricultural plants is being investigated. Much work has been done with cotton and

soy beans with respect to the factors influencing oil production, and this year peanuts and flax have been included in these experiments. In carrying out the field experiments the use of plats in a series, with a comprehensive system of checks, is supplemented with tests in large pots set in the field, the aim being to combine the desirable features of greenhouse pot cultures with those of field-plat tests.

FUNCTIONS OF THE SECONDARY ELEMENTS OF PLANT FOOD.—A large number of carefully controlled field plats are being used this year in tests with several crops as to the value of the secondary elements contained in mineral-fertilizer salts in favorably affecting crop growth. Recent investigations in this field have emphasized the possible practical importance of the subject.

One of the principal problems in connection with these investigations is the development of satisfactory methods for properly controlling the various factors of environment affecting plant growth, for without such methods little can be accomplished in differentiating between these several factors and heredity in crop plants. Large cylinders of earthenware so placed and managed as to permit the growing of plants under normal field conditions give promise of proving very useful in this work.

DRY-LAND AGRICULTURAL INVESTIGATIONS.

The investigations in dry-land agriculture in the Great Plains area under the direction of Mr. E. C. Chilcott have progressed along the lines set forth in previous reports. As a result of a material increase in the appropriation for this work for the current fiscal year three new stations are being established. One of these is located near Ardmore, in Fall River County, S. Dak.; one near Tucumcari, N. Mex.; and the third in the southern part of the "Panhandle" of Texas. The crop season has been a very trying one throughout the Great Plains region. Except at the extreme northern and southern ends of this region, the season has been exceptionally dry, and at several of the stations no crops were harvested. Such seasons as this fully demonstrate the importance of this line of investigations, and the need of a considerable number of these stations at different points in the area has been shown this year, when, notwithstanding crop failures at some of the stations, results of great value have been obtained from the experiments at others.

The results of the investigations in crop rotation and tillage methods have been published during the past year. The interest in this work is shown by the fact that the first edition of 10,000 copies of the bulletin was quickly exhausted and it has been necessary to issue two subsequent editions to meet the demand for information.

Cooperative relations with the State experiment stations of the different States in which the work is conducted have continued on a satisfactory basis.

WESTERN AGRICULTURAL EXTENSION.

The Office of Western Agricultural Extension, under the direction of Mr. Carl S. Seofield, has continued during the past year to operate a number of field stations for the Bureau of Plant Industry at various points in the Western States. With the exception of the

station near San Antonio, Tex., these field stations are located on projects of the Reclamation Service. By cooperative arrangements much of the investigational work conducted at these field stations is planned and to a certain extent supervised by members of the staff of the bureau. It is the aim to make these stations the centers for the investigation of various phases of the agricultural problems which are acute on irrigated lands and to apply the results of scientific investigation in actual field practice in the various localities.

YUMA EXPERIMENT FARM.—The Yuma experiment farm, of which Mr. W. A. Peterson is superintendent, includes about 150 acres of land located in the Colorado River Valley near the town of Bard, Cal., about 7 miles north of Yuma, Ariz. During the past season practically the entire farm has been cleared of native growth of cottonwood and willow and about 30 acres have been leveled and laid off in a series of half-acre plats for use in experimental work. The more important lines of investigation include experiments with Egyptian cotton, dates, forage crops, corn, bamboo, figs, and eucalypts. The farm is fairly well equipped with buildings, teams, and implements, and the present facilities permit the work to be handled in a very satisfactory manner. This farm is the headquarters for the work being done by the bureau in the way of establishing the culture of Egyptian cotton in the Southwestern States. Special phases of this work are dealt with in other portions of the present report.

TRUCKEE-CARSON EXPERIMENT FARM.—The Truckee-Carson experiment farm, of which Mr. F. B. Headley is superintendent, is located on the Truckee-Carson project of the Reclamation Service, 1 mile south of the town of Fallon, Nev. This farm includes about 160 acres of land, of which about 60 acres have been leveled and prepared for irrigation. Cooperative experiments with forage crops, cereals, corn, horticultural and truck crops, forest trees, and sugar beets have been continued, and also a special investigation, in co-operation with the Office of Soil Bacteriology of this bureau, to determine the causes of the infertility of the desert land. During the past year considerable attention has been given to drainage by means of open ditches, since the farm is located in a portion of the project where the ground-water table is dangerously high. Special attention has also been given to the production of alfalfa, since the desert soil is deficient in organic matter, and it has been found desirable to get alfalfa well established before undertaking extensively other crop experiments on the land. Some of the work with forest trees and fruit trees has been of direct benefit to the local settlers, particularly the discovery that the Russian oleaster (*Elaeagnus angustifolia*) is admirably suited to that region and serves a useful purpose for hedges and windbreaks.

SAN ANTONIO EXPERIMENT FARM.—The San Antonio experiment farm, of which Mr. S. H. Hastings is superintendent, includes 125 acres of land and is located 5 miles south of San Antonio, Tex.

The cooperative investigational work mentioned in previous reports has been continued, particularly in connection with studies of the native plants related to the cultivated fruit and nut trees. The soil of this farm, which is typical of a very large section of the south-

ern black lands of Texas, is highly calcareous, and one of the important agricultural problems is the finding of suitable stocks on which to grow fruit and nut trees, grapevines, and many ornamental plants. The major portion of the work on the farm is carried on without irrigation. Twenty acres of land are devoted to a series of crop-rotation and tillage experiments on plats one-fourth acre in size, and in connection with these experiments soil moisture and meteorological observations are being made.

BELLEFOURCHE EXPERIMENT FARM.—The Bellefourche experiment farm, of which Mr. Beyer Aune is superintendent, is located 2 miles northeast of Newell, S. Dak., on the Bellefourche project of the Reclamation Service. During the year this farm has been increased from 200 to 280 acres by withdrawing from entry 80 acres of land adjacent to the farm on the north. The cooperative investigations enumerated in the preceding report have been continued, with the addition during the past year of some investigations in connection with forage crops. Up to the present time no irrigation water has been available on the farm. It is expected, however, that irrigation water will be available early in the crop season of 1912. The present year has been extremely dry and practically no crops have been produced. Notwithstanding the severe drought, however, the forest trees which are being grown in cooperation with the Forest Service have done remarkably well and are giving some valuable data as to what may be expected from trees in this dry region.

KLAMATH EXPERIMENT FARM.—The Klamath experiment farm, of which Mr. John P. Irish, jr., was superintendent, has been operated on 40 acres of reclaimed swamp land in the so-called Lower Klamath Marsh, 14 miles southeast of Klamath Falls, Oreg. Work on this farm was undertaken at the request of the Reclamation Service to determine whether the reclamation of these lands for agricultural purposes would be practicable. The experiments were concluded early in the present crop season, and it has been decided that the lands are not suitable for agricultural purposes; the work has therefore been discontinued.

HUNTLEY EXPERIMENT FARM.—The Huntley experiment farm, of which Mr. Dan Hansen is superintendent, includes something over 300 acres of land in three tracts on the Huntley project of the Reclamation Service, near the town of Osborn, Mont. Up to the present time only about 100 acres of land have been put into crop. Cooperative work with cereals, forage crops, sugar beets, and orchard fruits has been undertaken with offices in the Bureau of Plant Industry. The Montana Agricultural Experiment Station is cooperating directly in the operation of this farm and is paying a portion of the operating expenses. The experiments with sugar beets form one of the special features of the work so far undertaken. About 25 acres of land are being prepared for a series of experiments in crop rotation and tillage methods under irrigation. It is expected that during the coming season additional cooperative work will be undertaken, particularly with the Office of Dry-Land Agriculture, in carrying on experiments in crop-rotation and tillage methods without irrigation.

UMATILLA EXPERIMENT FARM.—The Umatilla experiment farm, of which Mr. R. W. Allen is superintendent, includes 40 acres of land located 2 miles north of Hermiston, Oreg., on the Umatilla project of the Reclamation Service. This farm is operated under a cooperative arrangement between this bureau and the Oregon Experiment Station, by the terms of which the superintendent is directly responsible to the Oregon station, and the investigational work is planned and carried out cooperatively between the two institutions. Experiments with horticultural, fruit, and truck crops are the chief lines of work, some attention being given to green-manure crops and fertilizers.

SCOTTSBLUFF EXPERIMENT FARM.—The Scottsbluff experiment farm, of which Mr. Fritz Knorr is superintendent, is located on the North Platte project of the Reclamation Service, 6 miles east of the town of Mitchell, Nebr. This farm is under the administrative supervision of the Office of Dry-Land Agriculture of this bureau, and the experimental work so far as this office is concerned is limited to a series of crop-rotation and tillage experiments occupying about 25 acres of land. During the past year this land has been devoted to a grain crop with a view to getting it in proper condition for beginning the rotation experiments in the season of 1912.

MISCELLANEOUS COOPERATIVE INVESTIGATIONAL WORK.—In addition to the field stations mentioned, this office is cooperating with the North Dakota Agricultural Experiment Station at Williston, N. Dak., where Mr. A. M. Hawley is employed to supervise the irrigated crops at the Williston substation and to assist farmers on the project in connection with their problems of irrigating crops.

In connection with the investigations on the Klamath Marsh, it has been found desirable to investigate the agricultural practices on the reclaimed swamp lands in the delta of the San Joaquin and Sacramento Rivers in California, and during the latter part of the past fiscal year Mr. John P. Irish, jr., has been conducting these investigations from a point near Antioch, Cal. These investigations have to do with subjugating the raw tule land and determining the best methods of getting the land into crop and also in collecting data with respect to air drainage as related to the production of crops liable to damage by frost.

PLANS FOR FUTURE WORK.—With the discontinuance of the investigational work near Klamath Falls, Oreg., it is expected that another field station will be started on one of the reclamation projects during the coming fiscal year. This experiment farm will probably be located at some point in the Pecos Valley of New Mexico, where there are two small irrigation projects and where agricultural problems with reference to the production of cotton, alfalfa, and orchard fruits have become acute, owing to the saline condition of the soil and the ravages of the plant disease known as the cotton root-rot, which affects not only cotton but alfalfa and many other crop plants.

Investigations so far made in the delta of the San Joaquin and Sacramento Rivers in California indicate the importance of making further investigations in that region, particularly to try a number

of new crops. At present the number of crops which it is found possible to grow there is very limited. Several of these, such as potatoes and beans, which are now grown extensively, are seriously affected by disease if grown more than one year on the same land. New vegetables and forage crops suitable to these rather unusual lands should be tried in such a way as to ascertain whether they can be profitably produced under existing economic conditions.

During the past year the attention of the department has been called to the desirability of undertaking investigations in the Uncompahgre Valley in Colorado in the vicinity of the towns of Montrose and Delta. The recently completed Gunnison Tunnel has brought an increased supply of irrigation water into this valley and will result in the development of a large acreage of hitherto unused land. A considerable portion of the land in this valley is admirably suited to the production of fruit, alfalfa, and sugar beets; but considerable areas in the valley have soils the salt content of which is dangerously high.

On both this project and in the Pecos Valley of New Mexico it has become evident that the long-continued production of high-priced orchard fruits may result in abnormal conditions of the soil which may jeopardize the health and vigor of the fruit trees. The nature of these abnormal conditions is not well understood, nor are the most suitable remedies known. In view of the magnitude of the interests involved, not only in these valleys, but in numerous other irrigated regions of the West, it seems highly desirable to undertake investigations to determine the causes of the conditions which prevail and the best remedies for improving them. It is therefore thought desirable to inaugurate as soon as possible both in the Uncompahgre Valley in Colorado and in the Pecos Valley in New Mexico a series of physiological and pathological investigations in connection with field stations of this bureau in order to work on these problems of plant nutrition in irrigated agriculture.

ALKALI AND DROUGHT RESISTANT PLANT BREEDING.

The work of breeding drought-resistant crop plants, testing the alkali resistance of crop plants, and investigating the physiology of drought resistance and alkali resistance is being continued under the direction of Mr. T. H. Kearney.

DROUGHT-RESISTANCE PHYSIOLOGY.—In cooperation with the Physical Laboratory rapid progress is being made in ascertaining what factors render certain species and varieties of crop plants better adapted than others to dry-land agriculture. It is believed that the solution of this problem will greatly facilitate the work of plant breeding and variety testing for drought resistance. The results of these investigations to date indicate that the most important factor is economical use of the available soil moisture, as shown by a maximum crop production with a minimum expenditure of water. Further light on this subject is expected from the results of experiments now in progress, in which many of the important crop plants of the arid regions are being grown side by side under such conditions that the quantity of water used and the amount of crop produced by each can be accurately determined. These studies, which are regarded as

fundamental in investigations of dry-land agriculture, will be continued during the fiscal years 1912 and 1913.

INDICATOR VALUE OF NATIVE VEGETATION.—As stated in the Report of the Acting Chief of the Bureau of Plant Industry for 1910, it is now possible, as a result of investigations carried on under this project in the Great Plains area, to determine with reasonable accuracy from the character of the native vegetation the crop-producing capabilities of new land.

A reconnoissance has been made in portions of the Intermountain States (Utah, Wyoming, Idaho, Oregon, etc.) in order to locate a suitable area for conducting investigations along this line during the fiscal year 1912. In this region the object will be to determine what types of natural vegetation indicate land (1) suitable for dry-land crop production and (2) liable to injury from alkali if brought under irrigation. If the results warrant, this work will probably be continued during the fiscal year 1913.

EGYPTIAN COTTON IN THE SOUTHWEST.—The Yuma variety, the most promising of the new types of Egyptian cotton developed in the course of this plant-breeding work, is being tested by farmers at numerous localities and is giving every evidence of being a productive variety, yielding a high grade of fiber. The manufacturing firm which purchased several bales of this variety grown in Arizona in 1909 and 1910 pronounces the fiber superior to the grades of imported Egyptian cotton which they have been using.

During the fiscal year 1912 the breeding work will be continued as heretofore, attention being given to further improvement of the Yuma variety. Also, since different types of this class of cotton are required in different branches of manufacture, other less extensively tested strains which have been originated in the course of this breeding work will be tried on a field scale.

If Egyptian cotton becomes a commercial crop under irrigation in the Southwest, as now appears likely, it will be necessary to continue the breeding work during the fiscal year 1913 in order to maintain the strains already developed and, if possible, to improve still further the quality of fiber.

PHYSICAL INVESTIGATIONS.

The work of the physical laboratory, which is largely cooperative in character, has been continued during the past year under the direction of Dr. L. J. Briggs.

One of the principal lines of investigation has been the measurement of physical factors influencing the development of crops in dry-land regions which has been carried on systematically at the various field stations conducted by the Office of Dry-Land Agriculture in the Great Plains area. Similar measurements have also been made at the experiment farms on the reclamation projects conducted by the Office of Western Agricultural Extension and upon the farms of the Office of Grain Investigations. During the past year these measurements have been of special importance in the dry-farming regions on account of the exceptionally dry weather which has prevailed in many sections. It is under such conditions that the adaptation of crops to dry-land farming is most severely tested, and it is most important to

know accurately the conditions prevailing at such times. These records show definitely in many instances the cause of decreased yields, and taken in connection with the plat tests being carried on by the Office of Dry-Land Agriculture provide definite answers to many of the questions relating to the most advantageous use of dry-farming lands.

One of the most important factors governing crop production in dry-farming regions is, of course, the rainfall. Another factor, however, of almost equal importance is the amount of evaporation. The latter has been measured at each of the experiment farms since they were first established, and the data thus secured has been of the greatest value in the interpretation of the crop yields at the stations. A bulletin on this subject has been published during the past year in which the distribution of the rainfall and evaporation in the Great Plains and Intermountain States is given in detail and the relation of the two factors to dry farming in these regions fully discussed.

The most important line of work developed in the Office of Physical Investigations during the past year has been the determination of the extent to which different crop plants vary in their ability to reduce the moisture content of the soil before wilting takes place. It has been believed that drought resistance is largely dependent upon the ability of a crop to reduce the soil-water content lower than is possible in the case of nondrought-resistant crops. A long series of measurements made in cooperation with Dr. H. L. Shantz, of the Office of Alkali and Drought Resistant Plant Breeding Investigations, has shown that all plants are practically alike in this respect. In other words, if the water in a given soil is nonavailable to one plant it is also nonavailable to all other plants. Drought resistance, then, does not depend upon the ability of one plant to reduce the moisture content of the soil to a lower point than is reached by another plant. The establishment of this fact is of fundamental importance in the study of drought resistance, since this supposedly important factor can be eliminated and attention focused upon other matters.

While plants do not differ materially in the percentage of water which they leave in a given soil at the time of wilting, this percentage varies to a remarkable extent according to the kind of soil used. Thus, plants will reduce the water content of a coarse sand to 1 per cent before wilting, while they will wilt in the heaviest types of clay with a water content of 30 per cent. It is therefore essential in connection with any critical study of field crops in regions of limited rainfall to be able to determine accurately the available water supply at any time. This is represented by the water content in excess of the wilting coefficient, the latter term representing the water content at the time the plants wilt. The extension of the above investigation has shown that the wilting coefficient can be quickly determined by several indirect physical methods without the necessity of growing and wilting a plant in a particular soil. Of these indirect methods the most satisfactory is the moisture-equivalent method, in which the amount of moisture which the soil can hold in opposition to a powerful centrifugal force (1,000 times gravity) is determined. This bears a fixed ratio to the wilting coefficient, independent of the kind of soil used, so that the wilting coefficient can at once be calculated.

Among other important lines of work being conducted by this office may be mentioned an extensive series of field experiments at Akron, Colo., to determine the water requirements of crops in that region and the study of the physical factors determining such requirements; the influence of cultural methods upon the temperature and nitrification of some of the Great Plains soils; and the influence of electrical stimulation upon the rate of development of field crops.

FARM-MANAGEMENT INVESTIGATIONS.

The work of the Office of Farm Management, which has been continued under the direction of Prof. W. J. Spillman, has for its object the study and application of established agricultural principles and business methods to the farm. The work as at present organized and conducted falls properly within four groups, viz: (1) Studies of farm practice, (2) cost accounting and farm records, (3) farm equipment, and (4) farm problems or extension work.

For administrative purposes several lines of work which relate only incidentally to farm management have been assigned to this office, viz, investigations of the cactus, range investigations, weed investigations, hay-curing investigations, cassava investigations, and investigations of logged-off land.

STUDIES OF FARM PRACTICE.

This work embraces the entire country and is the most advanced of any of the lines of work carried on by the office. The investigations in the South are under the direction of Mr. C. L. Goodrich, successor to Mr. D. A. Brodie, who was assigned to general supervisory work. The work in the Northern States is in charge of Mr. C. B. Smith, while that in the Western States is under the direction of Mr. Levi Chubbuck.

One of the most important problems under investigation is the relation of farm practice to the maintenance of crop yields. The systems prevailing on a large number of farms and the resulting yields are carefully recorded. The data thus accumulated will, it is expected, ultimately enable the office to determine the effect on yields of different systems of tillage and of different crop rotations. It will also show the effect of leguminous crops and of all classes of cover crops used as green manures. The work also includes the study of the effect of different quantities and different methods of applying barnyard manure and commercial fertilizers. It also includes a study of the effect of different types of live-stock farming on the maintenance of yields. Important differences have been found in the effect of a given system on different soils, and careful attention is being given to the relation of farm practice to soil types.

In connection with this work a study has been made of cropping systems in several different sections, viz, on sheep farms in Vermont and on dairy farms in New Hampshire, which shows that much of the soil of these two States is gradually losing its productiveness under unwise cropping systems; in the potato sections of New Jersey; and in trucking sections where commercial fertilizers and high-priced manure from the cities are important factors. It is believed, from the studies which have been made, that cropping systems in-

volution the use of green manures and proper rotations will not only increase profits on the farm, but will maintain soil fertility more cheaply than is being done by present methods. A study is also being made of the cropping systems that have been developed in that portion of the Columbia Basin lying close to the boundary line between Washington and Idaho. Special attention is given to the methods used in growing legumes in rotation. It is expected that the results of this study will be ready for publication at the end of this season. The study of cropping systems on farms on which sugar beets are grown commercially has been continued, with the result that in various localities certain rotations have been worked out.

In connection with these studies cooperation is had with the agronomic offices of the bureau in the solution of agronomic problems in their territory. One of the most important lines of work conducted in cooperation with other offices is that of the more general introduction of leguminous crops as a means of soil improvement and as feed for live stock, particularly in the South. A study of the most practicable method of improving worn-out pastures has been commenced in cooperation with the experiment stations of Maine, Massachusetts, and New York, as well as the Office of Forage-Crop Investigations of this bureau. In the north-central tier of States cooperative experiments are being conducted to determine the varieties of corn best suited to rotation in the northern sections and the value of hairy vetch as a green manure and catch crop on the sandy lands of that region. In Ohio, Indiana, and Illinois better methods of seeding clover and its use in rotations in the corn belt have been worked out and a joint bulletin has lately been issued from the Ohio station. During the coming year work will be taken up in the southern portions of these States looking to the more extended use of cowpeas and soy beans in rotation with wheat and corn.

Another important type of study under this general heading is that of the system and methods employed on successful farms. Many of the more important problems confronting the farmer have already been solved by individual farmers, and the experience of these successful men is gleaned for the benefit of the less successful. A number of bulletins have been issued describing in detail the methods employed by some of the most successful farmers in the country. These bulletins have a very wide circulation and are in great demand. It is planned to continue work of this kind until the principal details of all the more important types of farming in all sections of the country have been covered.

Another feature of the work relating to farm practice is the making of working plans for farms, the aim of this work being to determine in a general way systems adapted to various sections of the country. The demand for these plans is greater than the ability of the office to supply.

A reconnaissance has just been made of the Ozark region and a comprehensive report is now on file in the office. A similar survey of what was formerly Indian Territory is now under way and a report will be placed on file at the end of this season's work. Some of the more pressing problems revealed by these reports will be made special subjects for study.

COST ACCOUNTING AND FARM RECORDS.

A great deal of attention has been given to farm records, and systems of bookkeeping suited to the needs of the farmer are being worked out in order that he may be able to ascertain the source of his profits and losses and the cost of the production of farm products. During the coming year it is hoped that a system of bookkeeping that will meet the needs of those farmers whose situation renders a system of accounting desirable and practicable will be ready for publication.

Methods of acquiring data on the cost of production have now been worked out and very complete records of every detail of operation on a large number of farms are being secured. It will soon be possible to give a first approximation of the average cost of all kinds of farm operations in those sections where this work is conducted. Much of this work has been done in cooperation with State agricultural experiment stations, especially those of Ohio, Wisconsin, Missouri, New Hampshire, and New York (Cornell University). This work will be extended during the coming year.

The records obtained in the cost-accounting investigations have enabled the office to study the labor requirements of the different farm industries for all seasons of the year. Information of this kind renders it possible to plan a system of farming that will require approximately the same amount of labor throughout the year instead of requiring a great deal at one season and little or none at other seasons. A large amount of such data is required in order to obtain reliable averages. Such information is accumulating from year to year and as soon as sufficient is at hand it will be summarized and published.

This work also includes a study of the distribution of the capital invested between real estate, live stock, machinery, equipment, etc., the labor hired, labor performed by the farmer and his family, expenditures, and income from all sources. The data obtained from each farm renders it possible to determine the labor income of the farmer and the rate of income on his investment. A report on one study of this kind, including every farm in four townships in southern New Hampshire, has already been published and similar work is in progress this year in four States. The results of these investigations give valuable information about the comparative adaptability of different types of farming to different sections of the country.

FARM EQUIPMENT.

The office has undertaken to determine the proper relation between the various items of equipment and buildings on the farm and to ascertain the relative amounts of capital which it is desirable to invest in the different phases of equipment in all of the principal types of farming. This work is new; while the results obtained are not extensive some of them are of great importance. Comparisons have been made in only a few localities of the cost of the dwelling and the farm income, but they indicate in a general way that the farmer is justified in constructing a dwelling the cost of which is approximately equal to the annual sum which is available for the living of the farmer and his family.

During the past year investigations of this character have been considerably extended and it is contemplated to enlarge them as rapidly as conditions will permit. An endeavor is also being made to establish standards of farm work and to determine the duty of different kinds of farm machinery. Methods have been worked out during the year for the collection and tabulation of data relative to the equipment on farms of various types, including the capital invested, the interior and exterior arrangement of buildings, gross income and cash expenditures, the daily duty of machinery, and the depreciation of machinery. Active work has been started in collecting this data in Virginia, New York, Missouri, Nebraska, and Minnesota. Several hundred farms have been inventoried and some 2,500 implements have been studied as to daily duty and depreciation.

FARM PROBLEMS OR EXTENSION WORK.

In order to bring home to the individual farmer and apply in a practical way the results of the various lines of investigation and study outlined, and in order, further, to assist the individual farmer to solve the problems peculiar to his farm, important extension work has been begun in a number of States. It is planned to enlarge this work as rapidly as the funds at hand will permit, recognizing the fact that it is the summation or bringing together in an applied practical way of the best available knowledge for the upbuilding of the farm. The work is planned so as to conduct it in close cooperation and full understanding with the experiment stations in the respective States.

At present the plan is to employ thoroughly trained men, preferably graduates of the agricultural college within the State where the work is to be done, who are not only familiar with the agricultural conditions within the State, but have sufficiently broad practical knowledge to guide farmers in the application of the leading principles involved. It is believed that one such leader will be needed for about each 20,000 farms. It is believed further that these leaders should be located at the State experiment stations. Under such men it is planned to have other men who can follow the general instructions given by the leader and then through literature, institute meetings, personal interviews, and demonstrations render direct aid to the farmer.

One of the difficulties encountered in this work is the large increase in the number of tenant farmers who as a rule are not interested in maintaining the fertility of the soil, their leases being usually made for short terms. The more general adoption of lease systems that will give the tenant an interest in maintaining the fertility of the soil is advocated and an effort made to induce landlords to aid their tenants in providing more live stock.

SPECIAL INVESTIGATIONS.

CACTUS INVESTIGATIONS.—Investigations are being continued at Chico, Cal., and at San Antonio and Brownsville, Tex., for the purpose of studying varieties and species of cacti, comparing their growth, using suitable ones for breeding purposes, and making critical studies of the effect of different environments. Great difference has been found in the growth of the various varieties.

At Chico and Brownsville stock of spineless pear is being grown for public distribution in cooperation with the Office of Seed and Plant Introduction of this bureau. During the past year about 21 tons of stock was distributed to 1,500 applicants. Much interest is manifested in these plants and more stock was called for than could be supplied. Past experience has shown us more accurately where the northern limits of the profitable culture of these plants lie. It now appears that the area shown in Bulletin 140 of the Bureau of Plant Industry must be reduced about 50 per cent.

Native spiny varieties grown at Brownsville have yielded at the rate of 50 tons per acre per annum, and the growth from old stumps the past two years promises an even greater yield.

RANGE INVESTIGATIONS.—During the year the economic and scientific study of the grama grasses has been completed and the results are to be published in the Contributions from the United States National Herbarium. Observations are still being conducted on the Santa Rita Reserve in Arizona and important phases of the range problems are developing.

WEED INVESTIGATIONS.—Investigations regarding the control of quack-grass have progressed and a bulletin has been issued describing the best means so far known of controlling this weed.

Work is still progressing in the study of methods for controlling the Canada thistle. Aside from the extensive experimental work, general correspondence with the farmers has resulted in getting together the experience of many farmers who have been able to control this weed on their farms.

Extensive tests are being made with herbicides for controlling vegetation along driveways, railroad rights of way, etc., for which there is an increasing demand. Preparations have been completed for extending this work during the coming year. Attention is also being given to the eradication of weeds in lawns, particularly dandelion, plantain, and crab-grass.

HAY-CURING INVESTIGATIONS.—Experimental work in the artificial drying of hay has been continued with satisfactory results and needed improvements and extensions have been made to the machinery to meet the requirements as the work developed. The study of markets and market conditions for hay has been continued.

CASSAVA INVESTIGATIONS.—The cassavas grown last year yielded a much heavier crop of seed than has been heretofore grown, while the yield of roots has been equally as good, which would seem to indicate that the work of acclimatization and the development of seed-producing strains is progressing satisfactorily. Seed was saved from 35 out of 48 varieties grown. This seed was planted at the beginning of this season and made a satisfactory growth. Canes packed last fall in dry soil under a shed came through the winter in fine condition and have been distributed for trial.

LOGGED-OFF LAND INVESTIGATIONS.—As reported last year, this work was closed up with the end of the fiscal year, and the reports of all the agents at work in the various States are now on file. A compilation of all results to date has been prepared.

FARMERS' COOPERATIVE DEMONSTRATION WORK.

The cooperative demonstration work among farmers in the South has been conducted during the past fiscal year with increased effectiveness and greatly extended influence. Until April 1, 1911, this work was under the supervision of the late Dr. Seaman A. Knapp, and since that date has been in charge of Mr. Bradford Knapp.

During the year the benefit of this work has been extended to many counties in the various Southern States, and the number of field agents has increased from 437 at the close of the fiscal year 1910 to 581 in 1911. Of these agents, 553 are State, district, and local agents in demonstration work among the adult farmers; 9 are specially engaged in the boys' and girls' demonstration work; and 19 are collaborating in certain work connected with the institution of girls' demonstration work to foster the home production of supplies.

During the present season 89,764 men, 55,075 boys, and 3,153 girls are receiving direct instructions from this office. This is an increase of 24,764 men and 13,000 boys over the number enrolled for instruction during 1910. The work among the girls for the production of home supplies was begun during the past fiscal year, and will be extended in the fall of 1911. Indirectly the work has reached many more farmers and many more boys than are indicated by the figures presented.

RESULTS OF THE WORK.—It is found practically impossible to obtain accurate reports from all farmers instructed. Many reports are mere estimates and must be discarded in giving accurate figures. Carefully compiled reports were received from adult demonstrators showing the results obtained in 10,576 cotton demonstrations, with a total acreage of 83,599 acres, and from 11,144 corn demonstrations, with a total acreage of 66,601 acres. It must be remembered also that this acreage is simply that which was measured and the crop carefully weighed. The influence of the work extended to a great many more acres than those mentioned. Of the cotton farms mentioned 6,117, comprising 68,297 acres, were in States wholly or in part infested with the boll weevil. A great number of additional reports were received from cooperators where the crops were not weighed or measured with sufficient accuracy to make the results of use in a statistical statement. Everywhere largely increased yields of corn and cotton were obtained by those who followed the methods advocated by the department in comparison with those who used ordinary methods. A careful computation shows that the average yield of cotton on demonstration farms was a little more than 85 per cent greater than the average yield of cotton of the whole States, as shown by the figures of the Bureau of Statistics. Even this does not represent the full benefit of the work, because the cotton raised under demonstration methods always shows a better percentage of lint than that grown by ordinary methods. The average yield of corn on the demonstration farms showed an increase of more than 93 per cent over the average production under ordinary methods.

The most noteworthy feature of the demonstration work in boll-weevil territory during the past fiscal year has been the pronounced success of a large number of demonstrators in raising cotton. The department's method of producing cotton under boll-weevil conditions

is fast being adopted by the most intelligent planters and farmers. This method was tested on large plantations with a large acreage handled by negro labor, and the success was pronounced. Demonstrations were made on fields ranging from 40 to 2,000 acres. In a number of instances with heavy infestation crops averaging practically a bale of cotton to the acre were raised. In a 2,000-acre demonstration the average of 350 pounds of lint cotton per acre was obtained, which the planter testifies is better than his average production per acre before the weevil came. A striking instance occurred where the department methods were not followed on 500 acres of cotton, resulting in the production of 100 bales. Near by was a 1,500-acre plantation on which the instructions were carefully followed, and the crop averaged half a bale to the acre on the entire tract. The results of the work for 1910 have practically restored the confidence of the people in boll-weevil territory, especially in southern Mississippi and the Delta regions of Mississippi and Louisiana.

It is too early to forecast crop results on demonstration farms for the present season, but it is worthy of note that a most magnificent fight has been made by the farmers of southern Mississippi and the Delta regions of Mississippi and Louisiana and by those of southern Arkansas. In southern Mississippi and Louisiana the early drought in June was followed by an extremely heavy and continuous rainfall during July, but during that time the farmers kept up the fight, and creditable results are expected. This fight has been led by the agents of the cooperative demonstration work, and they have been largely instrumental in encouraging the farmers to continue it. Great credit is given them by the farmers locally for saving the crop.

Some of the important results brought about by this cooperative demonstration work other than those already mentioned may be stated as follows: An increased use of selected home-grown seed; the greatly increased use of improved implements and machinery on the farm; a great amount of deeper and earlier plowing or breaking and better preparation of the seed bed; great increase in the number of pure-bred stock introduced and grown; a greatly increased acreage in hay and forage crops and in permanent pastures; widespread interest and greatly increased practice in maintaining soil fertility by the use of leguminous crops and stable manure; a greatly increased tendency to grow home supplies and make cotton the cash crop. Reports from implement dealers throughout the South indicate that the sales of improved machinery during the past year were nearly double those of any previous year. The demonstrations in corn and forage crops have naturally led to the introduction of pure-bred hogs, horses, cattle, and sheep. Much of this has been due to the direct influence of local agents, who are constantly receiving applications for information regarding live stock.

THE CORN CROP.—The department is still making an effort to bring about diversification and the production of home supplies. Great strides have been made in this direction during the past season. The figures of the Bureau of Statistics for the year 1910 show that both the total corn crop and the average production per acre were increased in practically all the Southern States. Taking the figures for the States of Virginia, North Carolina, South Carolina, Georgia,

Alabama, Mississippi, Louisiana, Arkansas, and Texas the increase in the total production of corn for the year 1910 over that of 1909 was 158,294,000 bushels, or 45 per cent of the total increase of the crop of the entire United States for those years. In Mississippi the total corn crop was increased by more than 60 per cent and the average production per acre by $33\frac{1}{2}$ per cent, while in Alabama the figures are almost equally good. For the first time since the war the Southern States produced such a large crop of corn that in many sections no money was sent out of the counties for the purchase of northern-grown corn. The production of home supplies has placed the farmer upon a more profitable footing. As the necessity for advances decreases with diversification and the production of home supplies, the bank deposits from farmers correspondingly increase.

WORK AMONG NEGROES.—Many negro farmers in all the Southern States are enrolled as demonstrators and cooperators, and all agents extend help to colored as well as to white farmers. Numerous striking instances of rapid progress from poverty to prosperity by individual negro farmers and communities as a result of the teachings of the demonstration work are on record. In sections where the majority of the farmers are negroes and conditions are such that it is possible to do so, agents of their own race have been employed. At present 21 colored agents are working with the farmers of their own race, and it is probable that the number will be increased during the present fiscal year.

COOPERATION BY OTHER ORGANIZATIONS.—During the year ended June 30, 1911, as for a number of years heretofore, the work in several States has been supported by funds appropriated by the General Education Board of New York for cooperation with the department in the demonstration work. These funds during the past year were expended in Florida, Georgia, North Carolina, South Carolina, and Virginia. The funds derived from the Congressional appropriation were used in Texas, Oklahoma, Louisiana, Arkansas, Mississippi, Alabama, and Tennessee. The work in all States was carried on in exactly the same way and all agents, whether paid by the department or from the funds appropriated by the board, were selected by the department and are under its complete control.

During the past fiscal year funds were appropriated by the States of Alabama, South Carolina, and Virginia and by many counties in Mississippi, Arkansas, Virginia, Texas, and other States, as well as by numerous boards of trade and other organized bodies of business men in various communities for cooperation with this demonstration work. The aid received by the demonstration work in this way increases yearly. In no other way is the value of this work and its general appreciation by the public more clearly shown.

During the past fiscal year laws have been passed in the States of Alabama, Louisiana, Arkansas, Texas, North Carolina, and Virginia authorizing county boards of supervisors to appropriate money to cooperate with the department in paying the salary of the local agent to do demonstration work. The extent of this cooperation can best be understood by stating that during the present fiscal year the cooperative arrangements mentioned will enable the department to do practically twice the work which could be done with the congressional appropriation alone.

The methods employed by the department in this work have been adopted by various railway managers in the South, who are undertaking a similar work along their lines in thorough harmony with the efforts of the department, resulting in extending the work into some counties where the department has not been able to employ an agent.

BOYS' AND GIRLS' DEMONSTRATION WORK.—A part of the problem of meeting the boll weevil has been the production of home supplies. The ordinary farmer in the cotton States in the past has depended upon cotton alone, and has failed to raise his own supplies. As a part of the plan of so changing the method that the home supplies would be produced the boys' corn clubs and girls' canning and poultry clubs have been introduced. During the season of 1910 the boys' corn clubs made a wonderful record. Many extraordinary yields were reported, largely due to the fact that the boys devoted their time and energy to a single acre. The 100 boys making the highest yields averaged 133.7 bushels of corn per acre on the 100 acres. In one county in Mississippi 48 boys averaged 92 bushels per acre. In a South Carolina county 142 boys averaged 62 bushels per acre. Prizes were donated by local people and obtained by general popular subscriptions. The leading prize in every State was a trip to Washington, given to the boy making the best record. A great deal of interest was aroused by the visit of these State prize winners to the city of Washington. They were presented with diplomas of merit by the Secretary of Agriculture, and much attention was paid to them by public officials and the people in general.

The effect of the boys' corn club work has been threefold: (1) It has materially assisted the department in bringing home to the southern farmer the fact that he can raise corn; (2) it has helped to break down prejudice in many communities against what is sometimes called "scientific farming"; and (3) it has also helped to give the boys an interest in farming and at the same time from its close connection with educational forces has been a powerful means of molding public sentiment regarding the teaching of agriculture in the schools, and especially in emphasizing the necessity for better rural education.

The work among girls has been started for the purpose of interesting them in the home life upon the farm. It seeks to show them how to raise a garden of vegetables, how to can the vegetables for market and for home use, and how to raise poultry at a profit. The expenses of this work are paid entirely from the funds of the General Education Board, but the work itself relates directly to the problem of raising home supplies instead of purchasing them out of the cotton crop. This year more than 2,000 girls are engaged in this work and it is expected that next year there will be many more. Prizes similar to those offered in the boys' corn clubs have been subscribed by various public-spirited citizens. The enthusiasm with which the work has been taken up indicates a rapid growth and a large extension of interest in home gardening and the raising of poultry.

COOPERATION WITH OTHER BUREAUS.—The large force of agents in the field, made possible by the cooperation of the southern people through State and county organizations and local associations, has

made the work a valuable agency in assisting other offices and bureaus in obtaining knowledge of field conditions and in taking information of great value to the farmers. During the past year assistance has been rendered to the department by encouraging the raising of peanuts, by the distribution of information regarding cotton wilt and other cotton diseases, by the distribution of wilt-resistant seed, by the selection of farmers for cooperative work with the department in other offices, while considerable aid has been rendered the Bureau of Animal Industry in assisting to educate the farmers as to the necessity of tick eradication in the Southern States.

PLANS FOR THE FISCAL YEAR 1912.—No important changes will be made in the general plan of the work for the coming fiscal year. Following the established policy of the department, the congressional appropriation will be spent in territory now infested or likely soon to be infested with the boll weevil. The work in Florida and the southwestern part of Georgia has therefore been transferred to the department rolls. Throughout the entire territory the work will be intensified and strengthened by the addition of new counties and by an increased average term of employment of local agents from seven and one-half to nine months a year, all of which is made possible by the increased funds available. The work in Texas, Oklahoma, Louisiana, Arkansas, Mississippi, Tennessee, Alabama, southern Georgia, and Florida will be supported by congressional appropriations; the funds derived from the General Education Board will be devoted to the work of preparing those States farther east for boll-weevil infestation. During the present fiscal year the work will be carried on in the northern part of Georgia, in South Carolina, North Carolina, and Virginia, and possibly in the southern part of Maryland.

An addition to the boys' demonstration work will be made by the organization of boys' cotton clubs in the various States. Cotton is the great staple crop of the South, and while the boys' corn clubs served the purposes already mentioned, they have also educated the boys to the point where they can make a greater success in the raising of cotton. During the present fiscal year clubs will be organized to a limited extent in all of the cotton States. Each boy will be required to cultivate 2 acres of cotton under instructions from this office. Special emphasis will be laid on seed selection and careful and intensive cultivation. As far as possible, boys who have had experience in the boys' corn clubs will be enrolled in this work. It has been found from experience that boys who raised cotton under the instructions of this office in the past few years have made a pronounced success. Occasionally boys in badly infested weevil territory have produced large yields where their fathers made failures, owing to the fact that the boys followed instructions implicitly.

PLANS FOR THE FISCAL YEAR 1913.—Except in localities where the department has secured the most hearty financial cooperation of States and counties it has been impossible to extend the work as rapidly as the demand for it would warrant. With financial assistance from the local people it has been possible in some States to organize a far better and more perfect system than in States where no financial assistance has been forthcoming. Constant demands for the work in the States where it is now being conducted come from

counties which have never been able to enjoy its benefits owing to the lack of funds necessary for its extension. There are still large sections in some of the States where not as much work is being done as should be done. It is planned to intensify the work and especially to endeavor to work immediately in advance of the boll weevil. Depending upon the rapidity of the forward march of the weevil, the work will be extended in Georgia and Florida. Special attention will be devoted to cotton production in Louisiana, now rapidly recovering from the disastrous effects of the weevil. Much work still remains to be done as the weevil advances in Arkansas and Mississippi, and during the next two years the department expects to do a great deal to prevent panic and maintain normal cotton production in Alabama. At the same time the cotton areas of Florida and Georgia will be prepared for the weevil by teaching better farm methods, the careful selection of seed, and the production of home supplies.

ARLINGTON EXPERIMENTAL FARM AND HORTICULTURAL INVESTIGATIONS.

The general maintenance and development of the Arlington Experimental Farm as well as the various investigations with potatoes, peanuts, and general vegetable crops have been continued the past year by Prof. L. C. Corbett. There has been no radical change in the policy of this work, but marked progress has been made in all the important projects.

THE ARLINGTON EXPERIMENTAL FARM.

The Arlington farm has now been in operation 10 years. The extensive utilization of its area and facilities by the various offices for field laboratory investigations attests the wisdom of establishing such a permanent field laboratory near Washington. The success of such work depends quite as much upon the management as upon the equipment. Mr. E. C. Butterfield, the superintendent, has so adjusted the management to a great diversity of requirements that the cooperative work of the place has steadily increased; in fact, the demand has been so great that it has come to be a problem to arrange the allotment of areas so as not to handicap investigations.

WORK OF VARIOUS BUREAUS ON THE FARM.—The investigations conducted at the farm by the Forest Service and the Bureaus of Entomology, Chemistry, and Soils have been largely a continuation of work previously outlined. That of the Bureaus of Entomology and Soils covers about the same area as heretofore, while the Forest Service has increased its area slightly by the additional planting of varieties and species of willows, and the Bureau of Chemistry has conducted considerable cooperative work with the Bureau of Plant Industry in the study of the respiration of fruits during the ripening process and the manufacture of starch from refuse potatoes. The Office of Drainage Investigations has made a topographic survey of the farm, which will be of considerable service in extending the tile-drainage system; also in the proposed reclamation of the farm marsh land.

The Bureau of Plant Industry has somewhat increased during the past year the area used for investigations previously outlined, and they now occupy about 110 acres, making a total of about 130 acres devoted to experimental work; in fact, practically all of the land

suitable for experimental purposes has been assigned and unless arrangements can be made to reclaim the marsh or otherwise extend the farm area it will be impossible to meet the demands for increased acreage.

GENERAL IMPROVEMENTS.—The appropriation has not increased proportionately to the increased cost of maintenance due to the rapid development of the farm and the high state of cultivation which it has been necessary to maintain; hence comparatively little has been expended for building purposes. A small gravity-brine cold-storage plant, having a capacity of about 7,000 cubic feet, was installed early in the year and operated about six months for the storage of potato collections. This has proved an exceedingly useful and satisfactory improvement. The heating plant has been improved by the construction of a radial brick chimney $3\frac{1}{2}$ feet in diameter and 60 feet high to replace three individual metal stacks which had become unfit for further service. This chimney will provide for the installation of additional boilers as they may be required. A 5-horsepower electric motor automatically controlled by float switches was installed for pumping purposes in maintaining a water supply, the 4-inch water main was extended to the north line of the barn and shop building, and three 2-inch fire plugs installed. Other minor improvements, such as the laying of about 4,000 feet of tile, the extension of gravel drives about the grounds and buildings, and some little grading and drainage work, were made during the year.

SOIL IMPROVEMENT.—The soil-improvement work, using leguminous crops, lime, and phosphoric acid as soil improvers, has been continued as in the past and supplemented by the application of about 417 loads of manure obtained from the Fort Myer military post. Much of the area which is not adapted to experimental purposes has now been sufficiently improved to grow grass and is devoted to meadows. This enables the farm to produce forage for its animals and at the same time improve quite rapidly the areas thus occupied.

GREENHOUSES.—The greenhouse work at the farm has been continued along the lines previously outlined. Special attention has been given to plant-nutrition studies and the improvement of forcing-house crops by seed selection from individual type plants. Two units were devoted to the propagation of roses, two to carnations, and two to bedding and shrubbery plants. Thirteen units were devoted to vegetable seed selection, two to cabbage, four to cauliflower, one to cucumbers, two to lettuce, two to tomatoes, and two to miscellaneous vegetable seed and plant selection. One unit was again assigned to the Forest Service for a germination test of forest-tree seeds.

NURSERY.—The nursery work has been conducted as heretofore. A great many plants have been removed for use in the grounds and for the variety orchard collections, and these have been replaced by new varieties and species. There are now in the nursery about 2,775 herbaceous plants in 119 varieties, 14,000 privet cuttings, 2,311 other shrubbery plants in 111 varieties, 3,023 ornamental trees in 83 varieties, 674 apple trees in 86 varieties, 21 plums in 6 varieties, 105 pears in 5 varieties, and 172 figs in 64 varieties.

LAWNS.—The landscape work at the farm has followed the lines previously outlined and, while the lawn areas have not been increased,

a little has been done in the way of planting ornamental trees and shrubbery. There are now growing upon the lawns about 314 deciduous trees in 45 varieties, 318 conifers in 48 varieties, and 1,347 shrubs in 81 varieties.

Of ornamental shrubbery 131 plants in 37 varieties were forwarded to each of three Forest Service nurseries for propagation and cooperative work with the Bureau of Plant Industry upon forest ranges. Considerable attention will be given this work in the future and plants are now being propagated in the nursery for this purpose.

HORTICULTURAL INVESTIGATIONS.

The horticultural investigations have been continued. Special attention has been given to the problems of truck growers. The crops which have received most time and effort are Irish potatoes, sweet potatoes, tomatoes, beans, cabbage, cauliflower, lettuce, beets, onions, and peanuts.

POTATO INVESTIGATIONS.—The Irish potato investigations have been continued by Prof. William Stuart and Mr. William V. Shear. During the year the fertilizer and rotation experiments have been continued at Norfolk, Va., and on Long Island. At both stations lime, either alone or in combination with fertilizers, has markedly increased the amount of scab on the tubers, but, contrary to the general belief, stable manure alone has not produced a similar result. The promising disease-resistant varieties of both European and American origin were grown near Burlington, Vt., in cooperation with the Vermont Agricultural Experiment Station. Disease-resistant sorts as well as the most promising sorts for general-crop and truck purposes were grown in Minnesota, Wisconsin, Michigan, New York, Virginia, Pennsylvania, and West Virginia, and the product was then planted at the Virginia Truck Experiment Station for comparison.

POTATO BREEDING.—The potato-breeding work of the season of 1910 consisted in the growing and harvesting of a large number of seedling potatoes, some 20,000 of which produced tubers. These were for the most part grown from seed obtained through artificial crosses made during the year 1909. The tubers produced from this large collection of seedlings were studied during the past winter and descriptive notes were made of the characters of the tubers from each individual plant. This work occupied the time of Messrs. Stuart and Shear for more than two months.

Successful crosses were made with varieties grown on the Potomac Flats as well as at Burlington, Vt. Those made at Burlington set a larger percentage of seed balls and produced a larger number of seeds per seed ball than those at Washington.

Fertilizer experiments, which were repeated at Norfolk and Staunton, Va., and Mattituck (Long Island), N. Y., gave results which in the main corroborated those of preceding years.

The place-effect trial work conducted at St. Albans, Vt., Scottsville, N. Y., Staunton, Va., Reedsville, W. Va., Traverse City, Mich., and Sabin, Minn., was all quite satisfactory. A quantity of seed sufficient for the trial at Norfolk was gathered from the varieties grown at each place and this was shipped to the Arlington farm for winter storage.

DISEASE-RESISTANCE TRIAL WORK.—The disease-resistance trial work with potatoes at Burlington, Vt., did not yield the results desired, owing to the nonappearance of "late blight." The Arlington collection of named varieties of potatoes was also grown at that place, together with a sufficient quantity of the Green Mountain variety to furnish seed for the Long Island work this season. In addition to maintaining the collection for disease resistance, hill-selection work was carried on at Burlington with the Green Mountain, Factor, and Up-To-Date varieties.

The fertilizer work at all the places mentioned has been continued. The place-effect trials are also being continued in all of the States mentioned and also at Stockton, Wis. The station in New York State has been changed to Honeoye Falls.

The largest undertaking this season is the handling and planting of our 20,000 seedlings. These are being grown at Honeoye Falls, N. Y., as are also the most promising of the Chilean seedlings and the Arlington variety collection. With but few exceptions the varieties embraced in the variety collection are all planted on the tuber unit basis. This has been done with a view to improve the type and increase their uniformity in size and number of tubers. Some 7,200 seedlings were grown in the Arlington farm greenhouse this spring and were transplanted to the flats early in May.

The number of seeds produced in individual seed balls obtained from the 1910 crosses were in most instances counted and a record made of the number of plants which these seeds produced. These data have so far proved very interesting, inasmuch as they afford an opportunity for a study of physiological affinity or nonaffinity between the different parent plants. The results thus far indicate that the prevalent notion that in order to insure vigorous seedlings only one or two seed balls should be allowed to develop on an individual plant is a fallacy.

The place-effect seed trials at Norfolk are proving as interesting as the diversity of the regions from which the seed came might suggest. Four diggings have been made at intervals of a week for the purpose of observing such differences in earliness as may occur from locality influences.

CLASSIFICATION OF VARIETIES.—Extensive character studies of the sprouting habits of different varieties of potatoes according to the ideas of Vilmorin have been carried out with the hope that ultimately a system of classification and grouping of strains may be brought about which will enable future plant breeders and students of potatoes to work with more precision than is possible under present conditions.

While the result of the season is very clean cut, it is not considered safe to base extensive commercial practices on one season's work; the trials will therefore be repeated before final judgment is passed.

PEANUTS.—The work of introducing the peanut as a farm crop in the boll-weevil district of the Southern States was started in 1909 with the planting of a few hundred acres by farmers in northern Louisiana, the object being to determine the possibilities of making peanut oil. This work was conducted under a cooperative arrangement between the farmers and oil-mill owners and the De-

partment of Agriculture. This experiment so thoroughly demonstrated the possibility of growing peanuts for the market in Louisiana and the adjacent States that contrary to the original intention the greater part of the crop harvested was sold for seed purposes rather than for oil making. During the season of 1910 the area increased to between 18,000 and 20,000 acres. The success of last year has led to the planting of approximately 300,000 acres for the season of 1911. At least 150 cars of the 1910 crop were sold for seed purposes, and the industry has been extended to other sections in eastern Texas, southern Arkansas, Louisiana, and Mississippi. In some sections peanuts are being planted on a large scale for feeding to farm animals, especially for fattening hogs.

In order to meet the demand for information and practical demonstrations of the methods employed in growing peanuts, more than 40 farmers' meetings were held during the winter of 1911 at various points within the boll-weevil region. These meetings were conducted by Mr. W. R. Beattie, of the Office of Horticulture, working in cooperation with State and local agents of the Farmers' Cooperative Demonstration Work. It is estimated that during these meetings fully 4,000 farmers received instruction. In addition to the lectures, practical demonstrations were made and about 3,000 bulletins on peanut culture were placed directly in the hands of interested growers.

Wherever the peanut has been introduced as a part of the crop system on plantations in the Gulf Coast States it has proved a valuable addition, especially as a feed for the animals upon the farm, for which purpose it takes the place of both grain and forage. Experiments have shown that by planting the peanuts rather closely it is possible to cut a ton of hay and afterwards produce 850 pounds of pork to the acre upon the peanuts. Peanut hay from which the marketable nuts have all been picked finds ready sale at prices ranging from \$12 to \$20 a ton. Many farmers are now planting large areas to peanuts for hog feeding alone, simply harvesting enough for seed and then turning the hogs into the peanut fields. By this very economical method the soil may be greatly enriched and a satisfactory financial return obtained.

With the present rapid increase in the acreage planted to peanuts it is probable that the general market will not long consume the product at prices remunerative to the farmer. The oil mills of the South are preparing to meet this emergency and will be able to crush the surplus peanuts for oil. Peanut oil is rapidly obtaining proper recognition upon the American markets and there will doubtless be a demand for all produced.

While peanut growing is being extended in the Gulf Coast States attention is being given to the industry in the regions where the crop has been extensively grown for the past 50 years. These investigations include various problems relative to crop rotation, seed selection, fertilizers, and methods of handling the crop. One of the most difficult of the problems which confront the farmer is to obtain a machine which will pick the peanuts from the vines without breaking the shells. Many of the machines now in use break a large percentage of the shells, resulting in damage from weevils and other warehouse insects during the summer months. Another serious difficulty is the depletion of soil fertility which has resulted from constant

cropping to peanuts; however, the farmers are now planting cowpeas and practicing crop rotation.

During the coming year it is proposed to continue the work already under way. The demands for information and demonstration continue and it is the purpose to guide and control the movement where it has become established rather than to encourage plantings in new territory, except for stock-feeding purposes. Problems connected with the market end of the industry are being investigated, and in solving them the hearty cooperation of the trade is assured. Investigation has shown that the acreage and production of the Virginia or "Jumbo" peanuts is not increasing in proportion to the trade demands, while the increase in the production of Spanish peanuts is soon liable to exceed present demands. In order to maintain uniform marketing conditions, experiments are under way for the purpose of devising means for the employment of a larger proportion of Spanish stock in the manufacture of peanut products. It has been found that by removing about 5 per cent of the oil from the cleaned meats of this stock the resulting meal makes a butter having about the proper consistency.

SWEET POTATOES.—In the work with sweet potatoes the study of varieties and their adaptation to various localities has been continued, several hundred small lots of seed having been sent out for trial. The problems involved in the storage of sweet potatoes have been under investigation, especially the determination of proper temperatures. At present considerable quantities of sweet potatoes are being grown for use in dehydrating tests to demonstrate the value of this crop as a stock food. Tests have shown that dried sweet potatoes have a feeding value almost equal to that of corn meal.

ONIONS.—The work already under way looking to the establishment of the Denia or Spanish onion in the United States has gone steadily forward. One experimenter in eastern Texas produced these onions at the rate of 36,000 pounds to the acre and sold them at 3 cents, or at the rate of \$1,080 an acre. Another experimenter successfully grew the seed, and now has a crop growing from this seed. The character of the product from this American-grown seed seems to be fully equal to that grown from the original importation. This appears to indicate with reasonable certainty the success of the Denia onion industry in this country. In the Bermuda onion district of Texas problems relative to fertilizers, crop rotation, and general soil technique are being investigated.

CELERY.—The investigation of problems with celery include the substitution of paper for lumber in the blanching process, observations relative to the excessive use of highly concentrated fertilizers in the production of the crop, and the after effects upon the land. Various questions relative to the storage and marketing of celery are being investigated; also experiments with machines designed for setting celery plants in the field.

VEGETABLE BREEDING.—Vegetable crops have received more attention in the bureau during the year than at any previous time. The work of breeding and standardizing the leading commercial groups of vegetables is now under the direct supervision of Dr. W. W. Tracy, Dr. D. N. Shoemaker, and Mr. N. H. Grubb.

The success of the work with cauliflower and lettuce under glass promises to be duplicated with cabbage and beets in the open. While this work is slow and tedious the results justify the effort. Pure strains of seed are as important and as valuable as pure strains of live stock.

The results so far accomplished are a pure strain of White Malakhof corn; a pure strain of early forcing cauliflower; an improved strain of Grand Rapids Forcing lettuce; and two strains of garden beets, which breed true to color and form. Promising results have also been obtained with cabbage and tomatoes. The endeavor in the work with tomatoes is to produce a forcing strain which shall be a sure cropper, prolific, high colored, and distinctively adapted for forcing purposes. The second line of endeavor is to obtain an outdoor tomato of medium season, producing an abundant crop of smooth, medium-sized, red tomatoes, ideal fruit for canning and catsup making. The preliminary test of sorts, together with their fitness for canning and catsup making, is well under way. More than 1,000 cans were required in the work of 1910.

Careful reciprocal crosses have been made with a number of sorts possessing characters of the greatest merit, with the hope that not only may new combinations result which are more valuable than any we now possess, but that at the same time some of the fundamental laws of plant breeding may be worked out.

VARIETY TRIALS.—As in previous years, samples of all seeds used in the Congressional distribution of seeds were grown to determine their purity and trueness to type in the trial grounds at the Arlington Experimental Farm. This work alone involved the careful handling of more than 2,000 samples of seed. Novel sorts offered by the trade to the number of 500 were also included in the season's work.

BEAN INVESTIGATIONS.—The work with beans has been more active than during any previous season. Selection work for the purpose not only of controlling disease, but for increasing the yield of field beans, has been started. If one bean per pod or one pod per plant can be added, the yield per acre will be increased 1 bushel per acre. It is believed that this can easily be accomplished through selection and attention to seed stock.

During the year a large collection of beans from South America was tested in comparison with several of the standard field and garden sorts of the United States. The collection contains one or two pole sorts of merit on account of their long season.

MUSKMELON INVESTIGATIONS.—During the season of 1910 experiments in cooperation with the Bureau of Chemistry were undertaken to determine the influence of soil and climate upon the quality of muskmelons. The season's work, which is considered preliminary, clearly reveals the importance of providing sanitary and cultural conditions which shall so far as possible provide comparable conditions at all points at which the tests are being conducted. It is believed that pathological conditions are often determining factors, as was apparently the case at one or two of the stations in this experiment.

POMOLOGICAL COLLECTIONS.

The work in connection with the pomological collections has been continued under the direction of Col. G. B. Brackett.

The great impetus given to commercial orcharding and the rapid extension of orchard areas throughout the country have given rise to an extensive correspondence on orchard management, as well as upon the hitherto unsolved problems connected with fruit growing. This correspondence has covered almost every subject pertaining to the fruit industry.

The demand for information has never been greater in the history of the office. Data on the best methods of orchard management have been collected and disseminated, while various fruit-growing organizations have been visited and lectures on pomological subjects delivered.

FRUIT IDENTIFICATION.—A greater number of specimen fruits were received during the year than ever before. The work of identification of varieties occupied much of the time of the pomologist and his assistants, fruits of 3,874 varieties being examined and identified. This work alone saves nurserymen and fruit growers many thousands of dollars annually by identifying for them the varieties of fruits they desire to grow for both commercial and domestic use.

Many new and hitherto unknown varieties of fruits of economic value have been examined, 561 descriptions, 417 paintings, and 27 models having been made in order to place the varieties on record, while 372 specimens have been added to the pomological herbarium.

SIMPLIFICATION OF FRUIT NOMENCLATURE.—Investigations looking toward the simplification of the nomenclature of fruits have been pushed with vigor, though, in order to meet the urgent public demand for special information on the walnut industry, it has covered the subject in a general way rather than being chiefly concerned with completing the data relating to the peach. Several thousand cards covering the nomenclature, origin, history, distribution, description, and value of fruits have been entered in the files. In the collection of these data considerable labor has been given to research covering the more important cases of confusion as to the origin, history, and synonymy of old varieties, while giving precedence to data pertaining to new varieties. The status of the work in nomenclature is as follows: Peach, almost completed; plum and cherry, about 20 per cent of the data collected; small fruits, 10 per cent collected; nuts, citrus, and miscellaneous fruits, fairly started.

SPECIAL POMOLOGICAL INVESTIGATIONS.—This office is continually adding varieties of fruits to the already extensive collection of trees now grown at the Arlington Experimental Farm. The test plat furnishes admirable opportunities for obtaining data at first hand concerning the relative merit and value of varieties. It enables the office to obtain copious notes for peach classification and has furnished valuable material for forthcoming bulletins on peach culture. The orchard also serves as a varietal check list and has enabled the office to furnish exact varietal data to specialists who are carefully studying the cultural conditions of the peach industry. With additional assistants it is hoped to make the investigations at Arlington a most helpful feature of the work on the classification and nomenclature of fruits.

PERSIAN WALNUT INVESTIGATIONS.—The work upon the Persian walnut has had in view the obtaining of exact information as to the status of this industry in the United States. A special field trip was made to the States of Washington, Oregon, and California, and the data thus obtained, together with that assembled from correspondence with representative horticulturists or growers of the walnut, have been embodied in a special report.

FIELD INVESTIGATIONS IN POMOLOGY.

Since the appointment of Mr. William A. Taylor as Assistant Chief of the bureau in 1910, the investigations with reference to the culture and handling of fruits have been carried on under the direction of Mr. A. V. Stubenrauch.

The work has continued along the same general lines as heretofore, and good progress has been made in the various investigations during the past year.

FRUIT-MARKETING INVESTIGATIONS.

The work of the utilization of surplus fruits and experiments with persimmons carried on in cooperation with the Bureau of Chemistry by Mr. H. C. Gore have been continued and full data have been obtained.

PROCESSING OF PERSIMMONS.—The experiments with the ripening of Japanese persimmons, begun several years ago, with a view to removing their astringency in advance of the softening of the fruit, showed definitely that the processing carried on by the Japanese in sake casks may be duplicated under more exact conditions by surrounding the fruit with an atmosphere of carbon-dioxid gas.

Experiments are now in progress to develop a practical method of using the carbon-dioxid process under commercial conditions, and work for the coming season has been planned along these lines in cooperation with persimmon growers in Florida.

PINEAPPLE DRYING.—Experiments in drying pineapples, in order that surplus ripe fruit and fruits too small for shipment may be utilized during periods of low prices, showed that a very acceptable product can be produced by partially drying and sugaring the fruits. The partially dry fruit absorbs a considerable portion of the sugar and a very acceptable sirup is produced as a residue. The dried and sugared pineapple is delicious when first prepared, but the indications are that some means of preserving its flavor and color is necessary. Experiments to determine these points are in progress.

While the drying and sugaring of pineapples is a rather expensive process, yielding a product suitable only for confectionery, it is expected that this way of utilizing the surplus fruits, in connection with the possible production of pineapple juice and sirup, will prove a practicable means of disposing of what would otherwise be wasted.

FRUIT JUICES.—Experiments with methods of preparing, sterilizing, and handling juices of various fruits are in progress. The fruits used include oranges, lemons, pineapples, peaches, grapes, cherries, strawberries, raspberries, blackberries, blueberries, huckleberries, and elderberries. A determination of the proper methods of preparing the juices is being made, and their holding qualities after sterilization and in cold storage without sterilization are being studied.

FRUIT TRANSPORTATION AND STORAGE INVESTIGATIONS.

The investigations relating to fruit transportation and storage have been continued along the lines of previous years and valuable results have been obtained. The work has been under the immediate direction of Mr. Stubenrauch, who has had associated with him in its various phases Messrs. S. J. Dennis, H. J. Ramsey, C. S. Pomeroy, A. W. McKay, G. H. Crawford, jr., C. W. Mann, B. B. Pratt, and K. B. Lewis. Mr. Ramsey has had general supervision of the field work. Mr. Dennis, as heretofore, has had immediate charge of the technical engineering problems in connection with the precooling investigations.

TABLE-GRAPE HANDLING AND TRANSPORTATION.—The investigations of the handling and transportation of table grapes which were carried on at Lodi, Cal., in 1908 and 1909 were continued during the shipping season of 1910 at Lodi with the Flame Tokay grape, together with a similar line of work with the Malaga variety at Fresno, Cal. The results of previous years which showed a definite relation between the type of handling given the fruit and the occurrence of decay and deterioration while in transit and after arrival in market were fully corroborated.

As in previous years, the investigations included a study of the effects of different methods of handling in picking, packing, and cooling, and the effect of delayed shipment was also studied. The investigations of the effects of precooling on table grapes were continued along with the handling experiments.

In all, 26 experimental series of grapes from Fresno and 54 series from Lodi were shipped to New York, where they were carefully inspected, the percentages of decay and deterioration being determined by weight. Each shipment consisted of a number of packages of grapes picked and packed under ordinary commercial conditions, together with the same fruit carefully picked and handled by the bureau workers and packed both in ordinary commercial crates and in boxes with a filler of redwood sawdust. The adaptability of redwood sawdust as a substitute for ground cork having been definitely shown by the work of the previous seasons, the use of the cork filler was discontinued. As in past years, portions of each kind of fruit and type of packing were placed on the floor or bottom tier and on the top tier of the load. Inspections in New York were made on arrival and on the third, fifth, and seventh days thereafter.

Again, the beneficial effects of using the redwood sawdust filler were most marked. In both the Malaga shipments from Fresno and the Flame Tokay shipments from Lodi the use of the redwood sawdust filler reduced the decay and deterioration in transit and on the market to a negligible minimum. In both the carefully handled packs in crates from Lodi and Fresno a very definite relation between the type of handling and the occurrence of decay in transit and after arrival in market was shown. The effect of careful handling on the behavior of the fruit after it is received in market is of great importance. It is as necessary to have the fruit remain sound long enough after arrival in market to be sold and consumed as it is to have it arrive in sound condition.

The results of the careful handling experiments were consistent throughout, indicating that carefully handled grapes can be safely transported to market over long distances when packed in the ordinary commercial crate now in use. A change to redwood sawdust is therefore not desirable, although the sawdust filler very materially reduces the decay. A change in the established method of packing and the type of package in use is not desirable unless it is shown to be absolutely necessary in order to assure the arrival of the fruit at market in sound condition.

TABLE-GRAPE STORAGE.—The investigations of the storage of grapes which were begun in 1907, and which have in view the study and determination of the factors which govern the keeping qualities of table grapes in cold storage with the object of lengthening their marketing season, were continued. The work has now reached a point where special phases of the problem bearing on the commercial application of the experiments need to be studied, and the investigations during the season of 1910 were planned largely with this object in view. The study of methods of handling and preparing the redwood sawdust to be used as a filler was a feature of the investigations. In addition, a study of the influence of the type of package was made in order to determine whether or not the ordinary box which has been used in the investigations thus far is the type of package to be recommended for commercial conditions. A comparison of the grapes packed in boxes with those packed in tight paper-lined drums holding about 25 or 30 pounds of fruit was made. The drum used is comparable with the barrel package used by the Spanish exporters in packing the Almeria or so-called "Malaga" grapes with a filler of ground cork.

The use of cork was discontinued and all packing was done with redwood sawdust. The sawdust was dried and carefully cleaned to remove the finer particles of dust and slivers which were found in previous years to cling tenaciously to the grape berries. The fanning out of the fine particles does away with the objectionable clinging of the sawdust particles, and the grapes have been found to remain in good condition when packed in the coarse material.

The varieties included in the storage investigations this year were the Malaga, Muscat of Alexandria, Dattier, Flame Tokay, Emperor, and Cornichon.

The most important results of the grape-storage work of the year are the full corroboration of the suitability of the cleaned redwood sawdust as a filler for grape packing, the necessity for prompt and quick cooling, and the apparent superiority of the round drum over the ordinary boxes used in previous experiments.

CALIFORNIA ORANGE HANDLING.—During the shipping season of 1910-11 the losses from blue-mold decay in many shipments of Washington navel oranges from California were higher than has been the case for several years. An urgent appeal was made to the department to undertake a study of the factors which might be responsible for the trouble. A careful study of the handling conditions in California during the season was made both to ascertain the causes of the decay as well as to corroborate and check up the results of the previous bureau work.

The work was planned along lines similar to those followed in the earlier investigations, which included a determination of the percentages of mechanical injuries made in preparing the fruit for shipment, together with a study of the relation of these injuries to blue-mold decay and the effect of various packing-house handling methods (washing, brushing, and packing without any special cleaning treatment), all furnishing data for a comparison of the behavior of fruit very carefully handled by the bureau investigators with fruit from the same groves picked and handled under ordinary commercial conditions.

A very large increase in the percentage of mechanically injured fruit in packing houses and groves which previously had been doing exceptionally good work indicated a serious letting down in the standard of handling. The average percentages of injury in the different houses and groves examined ranged from 4.8 to as high as 53.6 per cent. The injuries made by individual pickers ran as high as 85 per cent. Most of the injuries consisted of clipper cuts, but abrasions of various kinds, gravel punctures, scratches, etc., were present in large numbers.

Handling and packing experiments designed to give a direct comparison of fruit very carefully handled with the same type of fruit handled under ordinary commercial conditions, carried on in 25 different packing houses and including 49 experimental series of fruit, showed a very definite relation to exist between the type of handling given the fruit and the occurrence of the decay. Though the conditions for handling and marketing were very unfavorable, the fruit carefully picked and handled by the bureau investigators averaged less than 2.8 per cent of decay after being held for two weeks, while fruit from the same groves given the ordinary commercial treatment showed 14.9 per cent after the same length of time. The work showed conclusively that brushing and washing very materially increased the decay losses.

The work of the present season corroborates the results of the earlier bureau investigations in every respect and indicates that the proper solution of the decay difficulty rests mainly with the packing-house management.

PRECOOLING INVESTIGATIONS.—At Lodi, Cal., 12 full carloads of grapes were precooled and a number of special experiments with smaller lots were run in connection with the handling and shipping investigations in September and October, 1910. An average reduction of 22.05° F. in the temperature of the fruit in the cars was accomplished, after an average of 7 hours and 22 minutes, by forcing about 6,000 cubic feet of air per minute through the cars at temperatures ranging from 26° to 37° F. In the two seasons during which the precooling investigations of grapes were carried on the results of the work are rather indeterminate so far as the effect on the occurrence of decay in transit and on the market is concerned. No marked reductions in decay have resulted from the precooling treatment, and in some instances negative results were obtained. The indications are that some problems connected with the rapid reduction of the temperature of this very perishable fruit after loading in cars are not yet fully understood.

Further investigations of the precooling problems connected with California table grapes are necessary, and arrangements are being made for a series of experiments during the coming shipping season which will give a direct comparison of grapes precooled before loading in the cars and after loading. By these investigations it is hoped to determine whether the unequal cooling after the fruit is loaded in the cars is in any way responsible for the unsatisfactory results.

FLORIDA CITRUS-FRUIT HANDLING AND SHIPPING.—The investigations of citrus-fruit handling and shipping in Florida were continued during the season of 1910-11 on a broader and more comprehensive scale than has been possible in previous years. The lines of work included: (1) A comparison of fruit picked and handled carefully with ordinary picking and handling, and a comprehensive study of the effect of washing; (2) shipping experiments with carefully picked and packed fruit and fruit picked and packed in the ordinary commercial way, part of each lot being packed and shipped as soon as practicable after picking and part being delayed several days before packing and shipping; (3) inspections of oranges in the fields and packing houses for the determination of mechanically injured fruit and fruit with long stems, with demonstrations of the effect of such injuries on the keeping qualities of the fruit; (4) a determination of the percentages of "stem-end" decay in oranges shipped to Washington and the study of the occurrence of the stem-end rot under different conditions, including shipping experiments with fruit from sprayed and nonsprayed sections of experimental groves.

The washing experiments which were carried on in 32 packing houses, using 13 different types of washing machines, showed that an appreciable increase in the decay was due to the washing treatment. The increase in the decay was greater in fruit which had received ordinary commercial handling than in the same type of fruit carefully picked and handled. The results indicate that where washing is carried on, a chance for injury followed by decay occurs, but that where this method of cleaning is necessary to place the fruit in presentable condition the decay due to the necessary extra handling may be held at a minimum by care in handling the fruit in picking and grading and in manipulating the washing machines.

Shipping experiments, including 79 experimental series shipped from various points in Florida to Washington, D. C., showed 0.6 per cent of decay in all carefully picked and packed fruit, while the fruit from the same groves given ordinary commercial picking and packing developed 7 per cent decay from blue mold. The effect of careful handling continued through a three weeks' market-holding test, the carefully handled fruit after this length of time showing less than 2 per cent of decay, while the commercially picked and packed showed more than 14 per cent.

Results of the stem-end rot investigation showed no apparent relation between handling and the occurrence of this disease in transit or on the market. Spraying experiments and the use of different disinfectants in the water used in washing the fruit yielded indeterminate results.

The inspections to determine the amount of injury being done in picking and handling covered all of the citrus districts of Florida,

and in this work nearly 70,000 oranges were handled. A comparison of the work of the picking crews where the labor was paid by the day and by the box shows that equal percentages of injuries were made by both unless the work is done under the supervision of a capable foreman. In some instances the box-paid laborers were found to do as good or better work than those under the day-paid plan where no attempt at supervision was made.

The results of these lines of investigation corroborate in every respect the earlier work of the bureau, both in California and in Florida, and show definitely the relation between the type of handling given the fruit and the decay in transit and after arrival in market. The Florida orange when carefully handled has been shown to have good carrying qualities, and a notable improvement in the reduction of the losses from decay has resulted from the bureau work.

VITICULTURAL INVESTIGATIONS.

The viticultural researches of the year have been continued in charge of Mr. George C. Husmann, assisted by Messrs. Charles Dearing, Fred L. Husmann, and Richard Schmidt.

INVESTIGATIONS IN VINIFERA REGIONS.—Vinifera introductions to the number of 19, received through the Office of Foreign Seed and Plant Introduction, and 138 choice American grape varieties that are rapidly becoming extinct, received from other sources, were planted and are to be perpetuated with others previously introduced at the Plant Introduction Garden, Chico, Cal. Extensive propagation and congeniality and bench-grafting tests of 41 American varieties on 29 resistant stocks and 130 Vinifera varieties on 58 resistant stocks were also made and placed in the nursery at Chico.

The bureau's California experiment vineyards now contain 464 Vinifera, 439 American varieties, and 320 Vinifera varieties grafted on different resistant stocks, and very valuable data are being obtained. An additional experiment vineyard was located at Brawley, Cal., which is considered the earliest ripening district in the country, and regular checks of 211 Vinifera table-grape varieties have been planted there.

MIDDLE ATLANTIC STATES INVESTIGATIONS.—The renovation, pruning, and training experiments of old, run-down Concord vines on the farm of the Training School for the Feeble Minded, at Vineland, N. J., are resulting in the restoration of the vines to full bearing and vigor.

In the experimental vineyard at Vineland, N. J., 64 varieties are represented. Complete supports and trellises have been provided, and vines of each of the 32 principal varieties are trained to the fan, four-arm renewal, modified Munson, two-arm high-renewal, two-arm low-renewal, and stake systems to determine which system is best for each variety. The weight of the wood removed at last year's pruning varied in the order in which the six systems are here mentioned, being greatest for the first and least for the last named.

ROTUNDIFOLIA INVESTIGATIONS.—Yield records of Rotundifolia varieties trained on upright trellises and on overhead arbors indicate that profitable crops of grapes can be obtained a year earlier with the upright trellis system. A study of 1,152 Rotundifolia seedlings

has developed an interesting correlation between the color of the young foliage of the vines and the color of their fruit. The seedlings while young were separated into two lots, one having yellowish young shoots, the other reddish shoots. Without exception the fruiting vines of the former produce light-colored fruit, while the latter produce dark fruit.

Field surveys bring out the following facts: Interest in the *Rotundifolia* grapes is increasing; outside of local consumption and limited shipments for immediate consumption and table use the *Rotundifolia* grapes are used entirely for wine purposes for which white varieties only are in demand; the dark varieties bear best; the adaptability of varieties to localities has not been determined; a great difference in the saccharine and acid content of the several varieties exists, but no great difference in this respect is noted in the varieties themselves grown in different localities; black-rot injury on *Rotundifolia* is spreading rapidly.

FRUIT-DISTRICT INVESTIGATIONS.

There have been no material changes during the past year in the several lines of work which comprise the fruit-district "group" of projects. Mr. H. P. Gould has continued in charge of these investigations, aided by Mr. W. F. Fletcher.

ADAPTABILITY OF FRUIT VARIETIES TO ENVIRONMENT.—In order to meet a constantly growing demand for information relative to different fruit-growing regions, the conditions influencing successful fruit culture in them, the varieties best adapted to those conditions, etc., it has been the policy for several years past to make a general study each season of some important fruit-growing region which has not previously been investigated in the present connection. Some of the important sections of the western slope of Colorado were thus investigated during the past year.

As previously noted, similar investigations have been in progress for several years in the region which comprises that portion of Oklahoma between the Ozarks and the Great Plains, that part of Kansas which lies east of the Great Plains, and the southeastern part of Nebraska, and these investigations were continued during the season of 1910.

Though adverse climatic conditions in the spring resulted in light crops in most of the orchards, fairly good progress was made in the accumulation of data relating to the adaptability of fruit varieties. It is hoped that one more season's work will complete the field investigations of this region.

DRY-LAND RANCH FRUIT GARDENS.—The garden at Akron, Colo., maintained in cooperation with the Office of Dry-Land Agriculture Investigations, has not been materially increased during the past year. Several varieties each of raspberries, strawberries, currants, and gooseberries were planted.

The garden at present consists of 162 fruit trees comprising a number of varieties of apples, pears, peaches, plums, and cherries.

A large number of small fruits, including in addition to those just mentioned blackberries, dewberries, juneberries, buffalo berries, and various others, have been planted. The growth is fully satisfactory,

and they are in a more promising condition this season than ever before. The greatest difficulty appears to be in getting the small fruits started. Once fairly started they seem to persist, though in most cases it is not until the second or third season after planting that they have become sufficiently well established to make much growth.

A considerable number of plants of all the small fruits mentioned are now getting well established and are in a promising condition. Of the cane fruits the blackberries are apparently better able to withstand the conditions than any of the raspberry varieties thus far tried.

FOREST-RANGER FRUIT AND ORNAMENTAL GARDENS.—Substantial progress has been made in the forest-ranger work. As previously reported, the apple trees for distribution to the various ranger stations were propagated and grown at the Arlington Experimental Farm. The distribution was made in the spring of 1911 and included 2,680 apple trees, which were sent to 165 different ranger stations selected in cooperation with the Forest Service. The number of trees sent to each station ranged from 10 to 19, and 11 varieties of apples were represented in the distribution.

The distribution already made practically completes the present plans for this work except that a few more stations are to be supplied later.

MISCELLANEOUS POMOLOGICAL WORK.

PECAN INVESTIGATIONS.—The pecan investigations, under the charge of Mr. C. A. Reed, have been continued mainly along the lines followed in previous years. A considerable amount of orchard data has been obtained from field studies and observations; a careful comparison of the merits of the leading varieties has been made; specimens of a number of new varieties have been examined and reports made to the growers as to their merits; addresses before associations of nut growers have been delivered; and much information has been disseminated through correspondence and personal interviews.

The work will be continued and extended. The tabulation and correlation of the results of three years' experiments in the grading and cracking of specimen lots of the leading varieties will be given special attention in the immediate future. Careful comparisons of seedling pecans grown in the various States will also be made. Orchard observations as to the bearing of individual trees will be begun during the coming season in order to establish superior strains of some of the leading pecan varieties.

CITRUS-FRUIT IMPROVEMENT THROUGH BUD SELECTION.—The investigation of the possibilities of the improvement of citrus fruits through bud selection begun in California in 1909-10 has continued under the charge of Mr. A. D. Shamel, and has followed the lines of the preceding season. The methods of work adopted last year have proved to be satisfactory for securing and recording individual-tree data, illustrations, and descriptive notes. The data obtained this second season with the Washington Navel orange and Marsh pomelo corroborate the results of the first season; the variation in the total yield and the commercial quality of the fruit borne by individual trees under comparative environmental conditions were even more

strikingly shown by the past season's work. The trees that gave the largest yields of fruit in 1910 produced the largest yields in 1911 without exception. The trees bearing the smallest yields of fruit in 1910 produced the smallest yields in 1911. The most productive trees bore the best and most uniform fruit, i. e., the largest proportion of first-grade fruits of valuable sizes, the small-yielding trees bearing fruit of a poorer grade, of extreme sizes, and of variable quality which is of less commercial value than the higher grade and more uniformly sized fruits of the high-yielding trees.

A plat of 100 Eureka lemon trees, typical of the groves of this variety in California, located near Corona, has been selected for study by the same methods as those used for the study of the navel orange and pomelo varieties. The quantity, quality, and other characteristics of the fruit borne by the individual trees in this plat will be determined by regular monthly pickings.

An increasing number of fruit growers in California are undertaking a systematic study of plats of citrus trees by methods similar to those developed by the bureau investigations. As a rule, plats of 100 trees under uniform conditions are selected, the fruit of each tree being picked, assorted, and sized, each grade and size being weighed and the fruits counted, so that an accurate record is kept of the yield and commercial quality of fruit from each individual tree. These observations on the important varieties of citrus fruits, made under widely differing soil and other conditions, should add materially to the information on this subject and assist in the practical application of improved scientific methods of bud selection in replacing the unprofitable trees with more uniform and productive strains or varieties of citrus fruits.

EXPERIMENTAL GARDENS AND GROUNDS.

The work of caring for the greenhouses and grounds of the department has continued in charge of Mr. E. M. Byrnes.

CONSTRUCTION AND REPAIR OF BUILDINGS.—The area under glass on the department grounds has been materially increased during the year by the addition of a temporary greenhouse to care for a collection of citrus fruits and of another for the experimental work of the Physical Laboratory. As a precautionary measure, in case there should be a break in the underground steam main which now furnishes heat to the greenhouses from the central power station, two large secondhand boilers were installed adjacent to the greenhouses. These two boilers were turned over to the department by the Superintendent of the Capitol Buildings and Grounds without cost other than that incident to moving them and setting them in their present position. Such repairs were made to the older range of greenhouses as were necessary, and five of them were given a coat of paint inside and out. Fire protection was installed in the frame buildings on the north fronts of the ranges of greenhouses.

GREENHOUSE OPERATIONS.—There are now 27 greenhouses devoted to the propagation of trees, plants, and fruits collected by the Office of Seed and Plant Introduction; general hybridization work; seed testing; experimental work with a collection of citrus and other tropical fruits; experimental work conducted by the Office of Crop Physi-

ology and Breeding; propagation of plants for ornamenting the grounds of the department, for miscellaneous experimental work, and for special and congressional distribution; experimental work with vegetables; and plant-breeding work, which is satisfactorily proceeding with gratifying results. A bureau bulletin was published during the year as the result of this work. In one of the houses the chrysanthemums for the annual exhibition were grown. The exhibition was opened to the public on the morning of November 2, 1910, and closed on the evening of November 9, the house being open from 10 a. m. to 9 p. m. daily. Interest in these shows increases each year, and they are looked forward to by the public both in and out of Washington. After the exhibition was closed the flowers were cut and distributed to the hospitals in the city, as heretofore.

PROPAGATION AND DISTRIBUTION.—During the year 110,843 plants, representing 64 species and varieties, were propagated and distributed; 95,000 strawberry plants and 25,090 grapevines were packed and forwarded from the packing room for congressional distribution.

GENERAL IMPROVEMENTS IN THE GROUNDS.—Worn-out asphalt walks measuring 1,600 square yards were removed and relaid with concrete and 55 square yards of concrete walks repaired. Worn portions of the macadam roads were repaired and all macadam roads were sprinkled with waste sulphite liquor and an oil emulsion for the purpose of laying the dust and binding the surface so as to preserve it. The lawns were treated with 144 cubic yards of thoroughly decomposed stable manure, 7 tons of shredded cattle manure, and 6 tons of bone meal; 508 cubic yards of topsoil was used on a portion of the north front of Laboratory B to bring it to grade and the graded surface was seeded in grass. During the season the lawns were mowed, and such other work was done on the grounds as was required to maintain them in good condition.

ORNAMENTAL PLANTINGS.—A collection of 13,400 standard sorts of crocus, hyacinth, tulip, and narcissus bulbs, and 5,700 pansy plants were planted in the beds in the autumn for display in the early spring. A collection of 15,463 bedding plants, in 32 species and varieties, and 963 tropical plants, in 29 species and varieties, were planted in beds in the spring; also 106 seedling roses which originated in our greenhouses were planted for trial.

WORK DURING THE PRESENT FISCAL YEAR.—It is proposed to extend the frame shed at the north end of the greenhouses 32 feet to protect the steam pipes heating the citrus house; lay a concrete floor in the new building for the boilers, and 60 by 10 feet of concrete roadway for delivery of fuel to the boiler house; paint 17 greenhouses inside and outside; paint the paroid roofs of offices and work rooms and storage sheds; remove the worn-out asphalt walk, the oyster-shell and ash walks on the site of the old trial grounds and north front of Laboratory B; fill in the walks with topsoil and grade and seed in grass.

The work of hybridization, the experimental work with florists' crops and vegetables, the propagation of trees, plants, and shrubs, and the general care of the grounds are to be continued along the same lines as heretofore.

FOREIGN SEED AND PLANT INTRODUCTION.

The Office of Foreign Seed and Plant Introduction has remained during the past year under the direction of Mr. David Fairchild, agricultural explorer, assisted by Mr. P. H. Dorsett, plant introducer; Mr. Frank N. Meyer, agricultural explorer in the field; Mr. Peter Bisset, plant introducer; Mr. G. W. Oliver, plant propagator; Mr. Steven C. Stuntz and Mr. H. C. Skeels, botanical assistants; Mr. R. A. Young, scientific assistant; Mr. R. L. Beagles, Mr. J. A. Rankin, Mr. E. C. Green, Mr. Edward Simmonds, and Mr. Roy Mann, superintendents of plant-introduction gardens; Mr. H. F. Schultz, in charge subtropical introductions; and Mr. Edward Goucher, Mr. John H. Allison, Mr. W. H. F. Gomme, and Mr. Henry Klopfer, propagators.

This office has so perfected its machinery of rapid plant introduction and extended its network of correspondence throughout the world that it is now in a position to obtain with unusual dispatch living plant material on the request of plant breeders and experimenters, and, through the hearty cooperation of the pathologists and entomologists of the department, introduce it free from dangerous pests or parasitic fungi and get it into the hands of the experimenter in the form of well-grown plants with every possible chance of living in their favor.

The extent of cooperation with other offices of the bureau is shown by the number of successful experiments which other offices are carrying on with this introduced material. It is difficult to give any adequate idea of the large and growing corps of volunteer experimenters which is being interested in the careful and fascinating work of finding uses for the newly introduced plants and determining their climatic and soil requirements. Some of the most important observations in regard to the establishment of these new plants are coming from skillful and observant amateurs, and by the publication of its mimeographed bulletin of new introductions this office is stimulating a taste for this preliminary testing of new things that is sure to yield useful results.

Notwithstanding the fact that a closer discrimination has been exercised, the number of plant introductions during the year amounted to 3,045, or about 10 introductions for every working day.

AGRICULTURAL EXPLORATIONS IN CENTRAL ASIA.—During the year Mr. F. N. Meyer has finished the most difficult piece of agricultural exploration work of a pioneer character that has yet been undertaken by the department. He has spent seven months in the desert region of eastern or Chinese Turkestan, which lies between the Karakoram Range of the northern Himalayas and the great Tien Shan Range of western Mongolia. On foot or in native carts he has gone from oasis to oasis of this desert region studying the native fruits and grains. This has been accomplished with much difficulty, but he has made so careful a survey of the possibilities of the area that it will probably be unnecessary to go over this ground again. Mr. Meyer crossed the Tien Shan Range, passed through Kuldja and along the northern slopes of the Altai Mountains, and worked his way into northern Siberia, where he will collect seeds of forage crops and grains.

In no previous exploration work have the difficulties of getting living cuttings through to Washington been so great, but by means of postal shipments Mr. Meyer has successfully sent from the interior of Chinese Turkestan such cuttings as willows, poplars, plums, apples, and various ornamental plants, although they have required a month to reach us in addition to several weeks of transport by caravan.

At an altitude of 7,700 feet in the Tien Shan Mountains Mr. Meyer found apples growing wild, and made a special study of the somewhat bushy forms that grow on the barren slopes of the mountains of this region, which is characterized by short, hot, and dry summers, and long, cold winters. The valley of the Chong Djighilan is one vast wild apple and apricot garden, with a host of varieties differing in size and form. These are slow growers but very hardy, and such as will be of value to the fruit breeders of the upper Mississippi Valley for originating by crossing hardier types of apples and apricots for the Northwest.

Among the large number of things which Mr. Meyer secured during his explorations of Russian Turkestan, Chinese Turkestan, and Siberia, the following are worthy of special mention: A collection of table grapes, some of them possessing special shipping qualities; several species of desert poplars and willows which may withstand the cold and droughty conditions of the Northwest; forms of the bush cherry, an exceptionally hardy fruit for testing in the Great Plains; varieties of peach, nectarine, and apricot promising for trial along the northern border of the peach belt; seeds of the hardy wild apples and wild apricots which form the orchards previously mentioned; and large-fruited varieties of the oleaster, which are among the hardiest of all fruit plants.

Mr. Meyer will collect in considerable quantities the seeds of the hardy wild alfalfas which grow in the steppe regions of western Siberia and will explore the northern slopes of the Altai Mountains. Then he will work his way east to Peking, from which point he will proceed into the Kansu Province of western China in search of the hardy pears, jujubes, and persimmons of that region.

PROGRESS OF NEW INTRODUCTIONS.—After three years' observation in the neighborhood of Indio, Cal., one of the most reliable observers in the region predicts that the stock of the Chinese wild peach (*Amygdalus davidana*) will become the earliest fruiting stock for stone fruits, except cherries, ever introduced into California. In a region where early fruits bring high prices this character may make it of very great value to horticulturists. Larger quantities of the seeds of this species will be introduced and budded trees will be distributed to a large number of orchardists for trial.

A new light has been thrown on the problem of the production of a hard-shelled almond, comparable to the best Spanish almonds, by the fruiting of authentic trees of the Jordan almond at Indio in the desert region, at Niles in the coastal region, and at Nevada City in the foothills. None of the nuts produced by trees budded with stock imported from Spain have as fine a flavor or texture as the imported nuts, although those from the foothill region are superior in these respects to the others. An investigation of the soil and other conditions and the influence of the stock should be made to determine the cause of this marked difference.

The hardness of the large-fruited Chinese jujubes is indicated as far north as Washington and a very wide area of adaptability seems open to this new dry-land crop, whose preserved fruits compare quite favorably with the true date in quality.

The carob is an important fodder and shade tree for the dry hill-sides and roadsides in California; a successful introduction of the *Matalafera* variety from Valencia has been made through the American consul and hundreds of seedling carobs are now being grown to be budded with this variety, which is considered the most abundant and constant fruiter of all the Valencia carobs.

The Tamopan seedless and nonastringent persimmon promises to be a valuable acquisition from China and so far as possible the thousands of experimenters who are interested in testing it will be supplied with young trees this year. Its introduction, together with the working out in cooperation with the Bureau of Chemistry of the method of processing the Chinese and Japanese persimmon to remove the tannin and the assembling of various tropical species in Florida for breeding purposes have resulted in the increased development of this important fruit industry.

The bamboo garden at Brooksville, Fla., has been materially enlarged by the citizens of the place and the growth of the bamboos there has been so satisfactory that arrangements have been made for a permanent caretaker and propagator and for the propagation thereof of other plant introductions.

The collection of alfalfa species, upon which hybridizers are at work, has been augmented by forms from the Caucasus, from which promising crosses have been already obtained, and reports have been received from Siberia which confirm the belief that *Medicago falcata* is so valuable a species for the ranges that a special order has been sent to Mr. Meyer for the collection of quantities sufficiently large to make a thorough trial on the ranges of the Northwest.

During the past year the Japanese salad plant udo has been submitted to the public and pronounced a vegetable worth exploiting, one of the largest asparagus growers in America, after a preliminary trial, having set out a substantial area on reclaimed land near Stockton, Cal.

At least one of the aroid root crops, the dasheen, has been submitted to the public and pronounced a table delicacy, being used both as a vegetable and when made into flour. This crop can be successfully grown on lands that are too moist for practically any other commercial crops in the South.

Cooperative orchards of the mango and avocado pear have been established in Florida for the purpose of testing the various varieties which have been imported by the department. The work in these orchards will be extended during the coming season in order to assist the prospective mango and avocado planters to decide which varieties of these important fruits to plant. The increasing interest in avocado growing in California has made it advisable to supply cooperators there with collections of all the best varieties obtainable for experimental tests.

THE PLANT-INTRODUCTION GARDEN AT CHICO.—The facilities of the Plant-Introduction Garden at Chico, Cal., have been taxed to their limit in order to take care of the increasing number of new introductions, and it will be necessary to enlarge the garden to provide for

the propagation work demanded by the great increase in distributions. This garden has justly attracted wide attention, having the most extensive collection of new introductions in the country.

The demand from experimenters for material of an agricultural nature with which to work and the inadequacy of the propagating facilities at the gardens on the department grounds in Washington have made it imperative to establish a propagating garden where suitable nursery soil and other conditions could be obtained. Such conditions were found at Yarrow, Md., and 40 acres have been put under good tillage and thousands of new introductions planted.

THE SOUTH TEXAS GARDEN.—Progress at the South Texas Plant-Introduction Garden has been hindered by the appearance of alkali in the upper strata of soil as a result of irrigation, and until a system of underdrainage has been installed there is little hope of making the work of plant propagation a success. The presence of the root-rot has also complicated the situation. These various factors may make necessary a change in the policy of the work in southern Texas.

THE UPPER MISSISSIPPI VALLEY GARDEN.—The Upper Mississippi Valley Plant-Introduction Garden at Ames, Iowa, has been maintained in cooperation with the State experiment station, and already the new material that has been sent there has attracted attention to the desirability of the establishment of an arboretum in which such material as the hardy wild forms of apple, pear, peach, and apricot now growing in nursery rows can be fruited and the trees become available for the work of the plant breeders of the region.

THE PLANT-INTRODUCTION GARDEN AT MIAMI.—The progress of the work at the Plant-Introduction Garden at Miami, Fla., especially in connection with the propagation of the mango, avocado, and anonaceous fruits, has been extremely satisfactory, and on this account it is the intention to increase the facilities there by erecting a modern greenhouse.

FORAGE-CROP INVESTIGATIONS.

The forage-crop work, as continued under the general direction of Prof. C. V. Piper essentially along the same lines as heretofore, includes the investigation, extension, and demonstration of such forage crops as are of value or that may become valuable in this country. Some very interesting results have been obtained from the testing of new forage crops and also from strictly agronomic investigations. Certain general lines of work which have received the most attention are here mentioned.

ALFALFA.—The testing and extension of alfalfa in the East and the development and testing of hardy strains are the most important phases of alfalfa investigation. This work is under the immediate direction of Prof. C. V. Piper, who is assisted by various field men.

Tests of the alfalfas introduced by Prof. N. E. Hansen from Europe and Asia are being continued, and it is hoped that it will soon be possible to make some definite statements regarding the value of the new alfalfas on the open range and in comparison with the most hardy varieties of common alfalfa under cultivation. The hybrids which have been made between the yellow-flowered alfalfas from Siberia and the common alfalfas are still being tested,

especially for hardness. The superiority of these hybrids over the yellow-flowered parents is due to their increased growth and uprightness.

Considerable quantities of the seed of the Grimm alfalfa have been placed on the market and keen general interest has been aroused in this variety. The demand for seed is so great that unscrupulous dealers have resorted to fraud in connection with its sale. Prospective purchasers are cautioned to investigate carefully the source of the Grimm alfalfa that is now on the market.

Extensive tests are being continued with Peruvian and Arabian alfalfas in the Southwest. As a result of these tests considerable quantities of seed, especially of the Peruvian variety, have been produced in California and Arizona. This seed has met with ready sale, indicating the interest that is being taken in the varieties.

Alfalfa in many parts of the East is still in the experimental stage, although more is being learned regarding its culture each year. The interest in the growing of alfalfa has increased during the past season owing to the dry weather which has been quite generally prevalent. Regardless of the drought, the alfalfa crop has in many places flourished and proved to be exceedingly profitable. The turning yellow of many fields in the East this season has caused farmers much worry. While this condition is a serious one, it usually affects only the second crop and in many cases only the second crop of a 2-year-old field. Unless the conditions are very severe, this yellowing does not permanently injure the stand. The trouble appears to be caused by dry and hot weather, and the only remedy so far determined is to cut the field and remove the growth, even if it is not sufficiently heavy for hay. The crop following is usually normal. This subject is being very carefully investigated.

CLOVER INVESTIGATIONS.—The work with clovers, which is being conducted under the immediate charge of Mr. J. M. Westgate, consists in the testing of the relative merits of the different varieties, especially on soils no longer able to produce ordinary red clover successfully. The factors underlying clover-seed production are also being studied to determine the reason for the uncertainty of the clover-seed crop in so many sections.

Sweet clover is attracting wide attention and when properly utilized has been found valuable for forage and for soil improvement not only in the East but also in the semiarid parts of the West. The value of this plant as a cultivated crop is being tested under a great variety of conditions throughout the country.

GRASS INVESTIGATIONS.—The work of grass investigations is under the immediate direction of Mr. R. A. Oakley. Investigation of pastures is the phase of the work receiving most attention at the present time. Experiments at Blacksburg, Va., in cooperation with the Virginia experiment station are being continued in accordance with the original outline. The plats are now beginning to show the results of the various treatments, especially those where the rate of grazing is being tested. These experiments have shown definitely that continued light grazing is a detriment to the pasture grasses, and under such conditions noxious weeds are very likely to encroach rapidly. It has been found that in many cases grazing which is too light is as

harmful as heavy grazing. The beneficial effects of cultural treatments on the plats are already strongly in evidence. Experiments similar to those at Blacksburg are being conducted in Maine, Massachusetts, and New York.

A large proportion of the work in grass breeding is being conducted at a station established for this purpose at New London, Ohio. This station was started in 1909 and, notwithstanding the two very unfavorable seasons which have followed, a number of promising strains of timothy have been developed and enough seed obtained for plat tests. Several hundred selections of timothy are being made this season from fields in the close vicinity of New London. Improved strains of orchard grass, brome-grass, and clovers are also being developed at this station.

The introduction of Rhodes-grass has met with marked success in Florida and along the Gulf coast. In Florida especially this grass has aroused the interest of the farmers and stockmen to the point where they are desirous of seeding large areas of it for both hay and pasture. It is without doubt one of the most promising crops that has recently been introduced into that section. Rhodes-grass appears to be hardy in sections where the temperature does not fall below 18° F.

Sudan grass is another valuable grass, closely resembling Johnson grass but not possessing underground rootstocks and, therefore, not difficult to eradicate. It is hoped that this grass will be found to possess all the valuable qualities of Johnson grass and at the same time be easily controlled. It promises to be valuable both as an annual and as a perennial. As an annual, it is believed that it will in many sections replace millet. Sudan grass suckers readily from the stubble, and with sufficient moisture will give two or three cuttings in one season.

SORGHUM INVESTIGATIONS.—The testing of new and improved varieties of sorghum is being conducted largely at Chillicothe, Tex., under the immediate direction of Mr. A. B. Conner. Among the new sorghums that have shown the most promise this season are the kowliang, feterita, and pink kafir. Even in the most unfavorable season these varieties can be depended upon to produce a crop. Very definite results have been obtained from improved strains of the Sumac sorghum. These are proving to be superior in forage value to the common, unselected variety.

COWPEAS.—The testing of a very large number of cowpeas collected from various sources, together with numerous hybrids made by Mr. G. W. Oliver, has been conducted both at Arlington Experimental Farm and in cooperation with experiment stations, under the direction of Prof. C. V. Piper, assisted by Mr. W. J. Morse. Seed of some of the most promising of these varieties has been introduced on the market and appreciation of their value over the common varieties is constantly growing. The Brabham and Groit varieties have come rapidly into favor and during the past spring the demand for seed of these varieties has been much in advance of the supply.

SOY BEANS.—The soy-bean crop is already of considerable value in the Southern States, and it seems destined to become of much greater importance not only for forage but in all probability for the

production of oil and oil cake. In addition to continuing the work on numerous varieties at Arlington Experimental Farm and in cooperation with experiment stations, considerable attention has been given to hybridization and selection. The most promising of the many resultant new varieties are being grown for general testing. A few new varieties have already been introduced into the Southern States and have proved to be superior to those commonly grown.

LEGUMES.—The work of testing legumes on root-rot infested land is being continued more extensively than in the past, as the results obtained last season have warranted a more careful study of the problem. Certain strains of cowpeas have shown marked resistance to root-rot, among those deserving special mention being the Iron variety and its hybrids. It seems probable that valuable species of legumes will be found practically immune to the disease.

DRY-LAND FORAGE CROPS.—At Chillicothe, Tex., Chico, Cal., and Pullman, Wash., the testing of dry-land forage crops and the study of methods in connection with their culture has been continued along the same lines as during last season; likewise the work at the dry-land experiment farms in cooperation with the offices of Dry-Land Agriculture, Western Agricultural Extension, and Grain Investigations. The work at the dry-land stations is under the direction of Mr. H. N. Vinall. Interesting results are being obtained from varieties of Canada field peas, sorghums, millets, sweet clover, soy beans, and other legumes. Selections of *Agropyron cristatum*, a species of grass imported from Russia, have shown much promise, as have also selections of our native species, *Agropyron tenerum* and *Agropyron occidentale*. In the southern part of the Great Plains region cowpeas in mixtures with sorghum have given very satisfactory results. The Iron, Groit, and Brabham varieties of cowpeas have proved to be of the most promise in this connection.

MISCELLANEOUS FORAGE CROPS.—The bur clovers and vetches are being extensively tested as forage and cover crops. Much of this work is being done at Chico, Cal., and throughout the Pacific Coast States, under the immediate direction of Mr. Roland McKee. The production of seed on a commercial scale of the Tangier pea (*Lathyrus tingitanus*), black bitter vetch (*Vicia ervilia*), black-purple vetch (*Vicia dasycarpa*), and woolly-pod vetch (*Vicia biennis*) is being encouraged and will doubtless become an important industry especially in the vetch seed producing sections of Oregon.

CONGRESSIONAL SEED DISTRIBUTION.

The Congressional distribution of seeds and plants during the past year included standard and selected varieties of vegetable, flower, cotton, tobacco, and lawn-grass seeds, bulbs, grapevines, strawberry plants, and hybrid citrus trees.

VEGETABLE AND FLOWER SEEDS.—The contract for packeting, assembling, and mailing the vegetable and flower seeds was awarded to the Brown Bag Filling Machine Co., of Fitchburg, Mass., the lowest bidder, at \$1.105 per thousand packets, including delivery of the packeted seed in mail sacks direct from the seed warehouse in Washington, D. C., to the Union Station, thereby obviating the

necessity for rehandling several million packets by the postal authorities at the city post office. The work of packeting, assembling, and mailing the vegetable and flower seeds was begun on October 25, 1910, and completed on April 28. The total output was 49,570,370 packets of vegetable seed and 9,624,565 packets of flower seed. The demand for vegetable and flower seeds this year was greater than ever before, the entire quantity provided for having been sent out.

TOBACCO, COTTON, AND GRASS SEEDS.—A total of 3,118 packets of selected tobacco seed were distributed to persons especially interested in obtaining the best types of standard varieties as well as new and improved varieties developed by the bureau. Nearly 12,000 1-peck packages of cotton seed of improved upland and wilt-resistant strains developed by the plant breeders of the bureau were distributed. All of this seed was grown for the department under the supervision of its specialists. Of lawn-grass seed 16,133 half-pound packages were distributed, consisting of a mixture of Kentucky blue-grass, redtop, and white clover.

BULBS, PLANTS, AND CITRUS TREES.—Popular varieties of hyacinth, tulip, and narcissus bulbs were imported and distributed, a total of 11,040 boxes having been sent out. The distribution of grapevines involved 4,870 packages of 5 vines each, representing 27 different varieties; while 6,088 packages of strawberry plants, containing 15 plants each and representing 15 varieties, were also distributed. A total of 2,021 trees of the new hybrid oranges or citranges developed by the bureau were sent to growers in sections having favorable climatic and soil conditions, the recipient of each agreeing to give proper care and to report results to the department.

MISCELLANEOUS SEED DISTRIBUTION.—During the year 75,000 packets of vegetable seed and 51,000 packets of flower seed already found to be adapted were sent to Alaska, either for distribution through the experiment station at Sitka or upon direct requests received by the department. Small quantities of vegetable and flower seeds of suitable kinds were also sent to various army posts and to individuals in the Canal Zone, Hawaii, and the Philippines.

PRODUCTION OF DUTCH BULBS IN AMERICA.—The work of propagating Dutch bulbs at the cooperative garden near Bellingham, Wash., was continued during the past year. The mother bulbs from Holland are multiplying rapidly. A collection of bulbs grown at the bulb garden were tested on the department grounds this spring and found to bloom 10 days earlier than imported bulbs. There is every reason to believe that Dutch bulbs can be grown and propagated successfully in the Puget Sound region if they can be kept free from disease and climatic conditions continue favorable. The bulblets and offsets are now 1 and 2 years old and will not be fully developed for 3 or 4 years, when it is hoped that they can be used for congressional distribution and that sufficient data will then have been collected with regard to their propagation and handling to warrant the department in publishing the results of its work at Bellingham for the benefit of those who may wish to engage in the business of growing Dutch bulbs commercially.

SUGAR-BEET SEED GROWING AND DISTRIBUTION.—The commercial production of American-grown sugar-beet seed at Fairfield, Wash., by the breeding of pedigreed strains from individual analyzed mother beets has continued to receive attention. Comparative tests of varieties of sugar beets from European-grown seed were also continued in cooperation with State experiment stations, sugar-beet factories, and cooperative growers in different sections of the country.

PLANS FOR THE NEXT SEED DISTRIBUTION.—The seeds to be distributed the coming year will be practically the same in kind and quantity as last year, unless there should be a serious shortage in the seed crop and the price should advance sufficiently to make it necessary to reduce the quantity. Great care will be exercised to obtain only the best seeds the market affords, and all purchases will be made subject to rigid tests for purity and germination. Owing to the heavy demand for seed this spring and the depleted stocks of seed in warehouses, a larger percentage of the seed will be grown under contract than formerly.

REPORT OF THE FORESTER.

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D. C., November 24, 1911.

SIR: I have the honor to transmit herewith a report of the work of the Forest Service for the fiscal year ended June 30, 1911, together with an outline of the plans for the work of the Service for the current fiscal year.

Respectfully,

HENRY S. GRAVES,
Forester.

HON. JAMES WILSON,
Secretary of Agriculture.

CLASSIFICATION OF EXPENDITURES.

The appropriation act for the Department of Agriculture for the fiscal year 1911 and other acts made available for the Forest Service the following sums:

For salaries ¹	\$60,200.00
For general expenses.....	4,672,900.00
For improvement of the National Forests.....	275,000.00
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Total appropriated for Forest Service under the agricultural appropriation act.....	5,008,100.00
Available for the work of the Forest Service under other clauses of the act:	
For paper tests 1910-11.....	\$30,000.00
For naval stores industry study.....	4.55
	<hr/>
	30,004.55
Available under the deficiency act ²	900,000.00
From other sources:	
Federal cooperation (expenditures reimbursed by other Federal bureaus).....	2,189.67
Private cooperation (\$7,620.38 contributed by co-operators in 1911; \$7,295.21 brought forward from 1910; less \$311.29 returned to co-operators).....	14,604.30
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	16,793.97
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Total from all sources.....	5,954,898.52

At the close of the year there were unexpended balances as follows:

From appropriation salaries and general expenses.....	\$29,615.27
From appropriation improvement of the National Forests.....	1,365.58
Unexpended cooperative funds (carried to fiscal year 1912).....	3,977.71
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	34,958.56
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Amount expended.....	5,919,939.96

¹ In addition to this appropriation for salaries for specific positions, the appropriation for general expenses was available for salaries for the purposes set forth in the bill.

² This appropriation was made necessary by the heavy emergency expenditures for forest-fire fighting incurred in August and September, 1910. The extra expenditures for fighting fires totaled \$1,086,590.89.

The total expenditures from the above sources for the work of the Forest Service, including extra expenditures for fire fighting, were therefore \$5,919,939.96. The \$1,086,590.89 which, as already stated, was disbursed in fighting fires covers only the charges incurred specifically for this purpose, i. e., the hire of temporary laborers when the regular force of forest officers is too small to handle the fires, payments for transporting and provisioning these men, the purchase of tools for their use on the fire line, etc. In addition there was the cost of the regular protective force of nearly 1,500 rangers and over 500 guards, and also that of the supplies and equipment and field and station expenses for other purposes than fire fighting. These four headings of (a) extra expenditures of fighting forest fires, (b) cost of regular protective force, and (c) cost of field and station expenses, supplies, and equipment, together with (d) the cost of permanent improvements on the National Forests, make up the strictly field expenditures on the Forests; though the charge entered below under the head of (e) supervision and inspection includes both salaries and traveling expenses of supervisors and deputy supervisors on the Forests, whose duties involve to a large extent work, both office and field, which are not, strictly speaking, supervisory.

This item of supervision and inspection includes also the salaries and expenses of the supervisory men in the six district offices. The other items in the cost of National Forest administration are (f) technical assistance, which includes the services of timber and mining experts, engineers, land examiners, etc., as well as forest examiners and forest assistants, and (g) clerical, law, and accounts work. The amount of the charge for each of these items is shown below:

Expenditures for the National Forests (not including expenses at Washington):

(a) Fighting forest fires.....	\$1, 086, 590. 89
(b) Protective force.....	1, 786, 548. 43
(c) Field and station expenses, supplies and equipment.....	841, 672. 51
(d) Permanent improvements	273, 634. 42
(e) Supervision and inspection.....	580, 720. 07
(f) Technical assistance.....	393, 922. 25
(g) Clerical (including law and accounts).....	402, 534. 96

Total.....	5, 365, 623. 53
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The remaining expenditures for the Forest Service are partly for the support of the Washington office, partly for the Madison laboratory. At the Madison laboratory are concentrated the technical studies having to do with forest products. The cost of the Washington office covers general supervision of the entire work of the Forest Service, including the administration of the National Forests; the cost of all scientific investigations; and also a great deal of routine work for the National Forests which can be done more economically at Washington than in the districts, either because of the advantage of concentrating the work or because of the necessity of consulting the records of the General Land Office.

Adding in the cost of the Washington office and the Madison laboratory, the total expenditures of the year become:

National Forests (not including expenses at Washington).....	\$5, 365, 623. 53
Madison laboratory.....	153, 710. 69
Washington office.....	395, 605. 74
Total.....	5, 919, 939. 96

There were also made under the direction of the Forest Service the following miscellaneous expenditures:

Examination of lands, titles, etc., under the Weeks Act.....	\$18, 076. 07
National Bison Range, Mont.....	2, 381. 61
Refunds to depositors, excess deposits (34 Stat., 1270).....	57, 912. 73
Payments to States, 25 per cent of receipts from National Forest resources for fiscal year 1910.....	506, 194. 83
Cooperative funds returned to contributors.....	311. 29
Total.....	584, 876. 53

In addition a liability of \$224,000 was incurred through a contract entered into for the purchase of lands under the Weeks Act, and expenses of the National Forest Reservation Commission, amounting to \$178.57, were defrayed.

The following statement shows the amounts paid to States and Territories, to be expended for roads and schools, from the National Forest receipts of the fiscal year 1910, and the amounts that will be paid from the receipts for the fiscal year 1911:

State or Territory.	Amount paid fiscal year 1910.	Amount payable fiscal year 1911.	State or Territory.	Amount paid fiscal year 1910.	Amount payable fiscal year 1911.
Arizona.....	\$51, 229. 38	\$55, 385. 45	Nevada.....	\$16, 314. 33	\$12, 198. 38
Arkansas.....	2, 904. 44	3, 487. 04	New Mexico.....	28, 529. 53	32, 541. 50
California.....	60, 752. 91	53, 717. 42	North Dakota.....	63. 64	71. 41
Colorado.....	50, 306. 19	52, 372. 28	Oklahoma.....	626. 10	273. 67
Florida.....	706. 38	1, 381. 41	Oregon.....	39, 635. 87	35, 612. 29
Idaho.....	66, 074. 55	52, 594. 33	South Dakota.....	9, 808. 93	14, 197. 32
Kansas.....	1, 004. 67	919. 10	Utah.....	32, 905. 49	34, 869. 10
Michigan.....		4. 25	Washington.....	23, 671. 89	24, 111. 36
Minnesota.....	457. 37	1, 309. 55	Wyoming.....	34, 704. 54	30, 126. 52
Montana.....	83, 678. 38	74, 021. 04			
Nebraska.....	2, 820. 25	3, 183. 31	Total.....	506, 194. 84	482, 376. 73

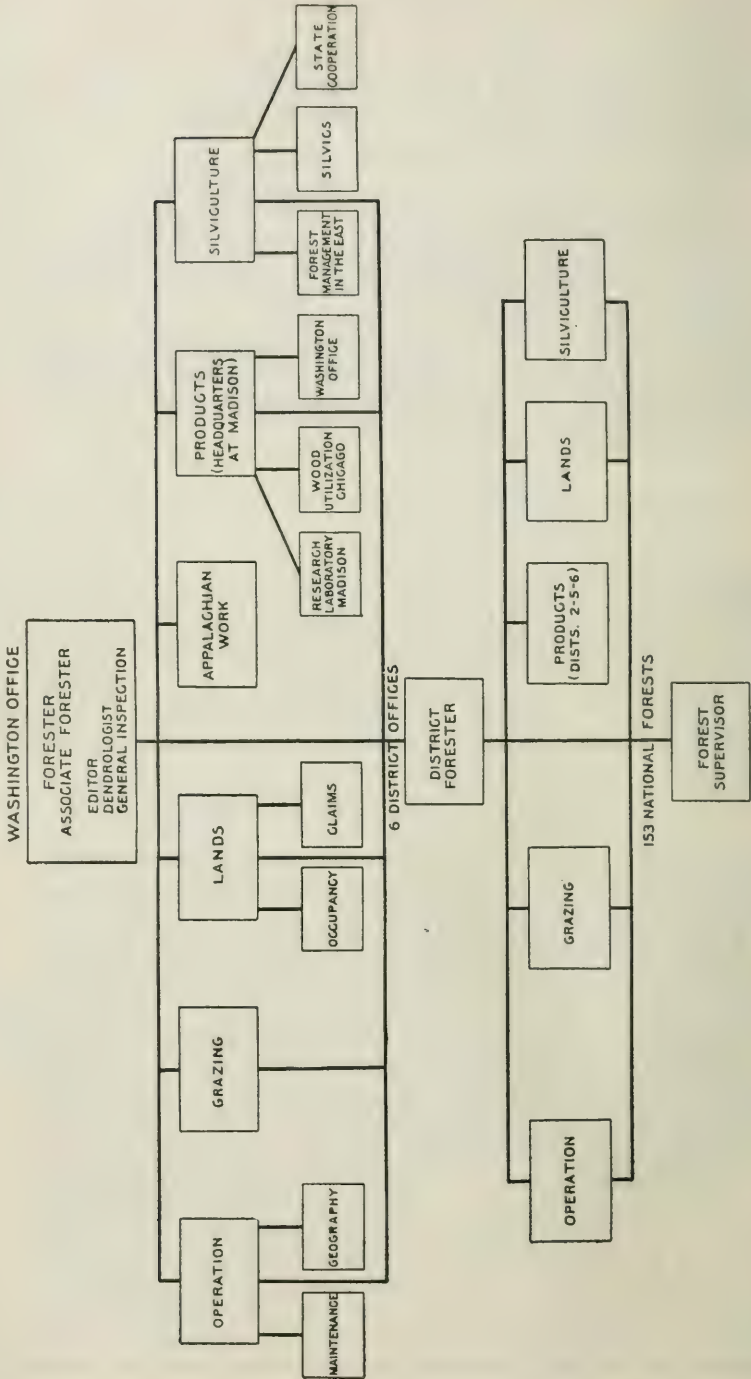
ORGANIZATION AND PERSONNEL.

The form of the organization of the Forest Service at the close of the fiscal year June 30, 1911, is shown graphically on page 6. The only important change during the year was the addition of a new unit to handle the work arising under the Weeks law in connection with the purchase of lands on the watersheds of navigable rivers. Mr. W. L. Hall, formerly in charge of the Branch of Forest Products, was assigned to the direction of this new work. A small supervisory organization is maintained at Washington, but the principal force, engaged in the examination of lands and negotiations for their purchase, is located in the field. Field headquarters were established at Asheville, N. C., and at Concord, N. H.

An important change which does not appear on the chart was a substantial reduction in the number of supervisory officers in Washington and in the districts. It has been the consistent policy of the Forest Service to conduct in the field as much of the business of the National Forests as possible. This was the purpose in establishing the six district offices. Just as fast as it was deemed wise increased responsibility was placed upon the district officers, and in turn the district foresters steadily increased the responsibilities of the supervisors as fast as they became sufficiently experienced to assume them; and again in turn the supervisors from time to time increased the

ORGANIZATION OF THE FOREST SERVICE

JUNE 30, 1911



responsibilities of the rangers. It is obvious that during the early period of building up the technical organization it was necessary to maintain a considerable force of officers charged with supervising and inspecting the work on the Forests. The gradual reduction of the supervisory force at Washington and in the districts has been carried on now for about three years, and amounts to fully 33 per cent. In the Washington office the number of men holding the title assistant forester has been reduced to four. In the districts the office of associate district forester has been dispensed with, and there has been curtailment in each district office of at least two assistant district foresters. During the past year alone the supervisory force in the districts was reduced by 19 men. The men occupying these positions were for the most part promoted to fill vacancies or for one reason or another have resigned from the Service.

In districts 5 and 6 the district foresters, Mr. F. E. Olmsted and Mr. C. S. Chapman, resigned their positions, the first to enter private business as a consulting forester, the second to accept a position with the Oregon Fire Protective Association. In these men the Forest Service lost two of its most experienced and capable officers; Mr. Olmsted was appointed in 1900 and Mr. Chapman in 1901. Their positions were filled by the promotion of District Associate Foresters Coert Du Bois and George H. Cecil. The district forester in district 1, Mr. W. B. Greeley, was transferred to Washington to assume charge of the Branch of Silviculture, vacated by Mr. W. T. Cox, who, to my keen regret, resigned from the Forest Service to become the State forester of Minnesota. In district 2 the associate district forester, Mr. Paul G. Redington, was transferred at his own request to the position of supervisor of the Sierra Forest. The associate district foresters in districts 3 and 4, Mr. Franklin W. Reed and Mr. Earle H. Clapp, were transferred to the Washington office as inspectors, the first in the Branch of Operation and the second in the Branch of Silviculture.

While a certain amount of drafting and map work is conducted in the district offices, and a small amount necessarily on the Forests, the greater part is concentrated at Washington for reasons of economy. A great deal of scientific work centered at Washington is closely related to Forest administration and is for the purpose of developing better methods of silviculture and range management. It is, however, properly carried as a separate charge. The total force at Washington has been increased in spite of the reduction in the administrative officers. This is due to the additional work required under the Weeks law, to the greater amount of work in accounts resulting from the new form of the appropriation bill, to the introduction of a more detailed system of cost accounting, and to expansion in certain phases of research work, notably range investigations, dendrology, and forest products.

In the districts the administrative force has now been cut to the district forester and four assistant district foresters. In addition, there are specialists who assist in certain lines of work, as, for instance, the district engineer, expert lumbermen, assistants in planting, mineral examiners, etc.

The policy of reducing the overhead charges to a minimum and expending the available money on operating expenses has been carefully applied also on the Forests themselves. In general, the

organization of a Forest consists of a supervisor, a deputy supervisor, a forest clerk, and a group of rangers. The need of the deputy supervisor is to enable constant field supervision of the rangers and of their work. An efficient clerk is frequently able to handle the bulk of the routine office business, so that often the supervisor and deputy supervisor can be in the field at the same time. The effort is to reduce to a minimum the office routine which must be handled by the forest officers themselves in order that their time may be spent in directing the details of the business of the Forest. Where the work requires it, a forest assistant is assigned to the supervisor's office to assist him in miscellaneous lines of technical work and in such experimental and scientific studies as may be conducted on the Forest. In general, there is a group of permanent rangers on each Forest employed during the entire year. The force of rangers is kept down to the smallest number compatible with a permanent organization. During the summer additional rangers are appointed for from three to six months of service. The latter are recruited from the civil-service register, as in the case of the permanent rangers. Temporary forest guards are also appointed during the summer for fire patrol, the construction of trails, and other temporary work.

A systematic plan has been introduced to bring about the most effective distribution of the rangers' time. A detailed cost-keeping plan has been put into effect, and the forest officers are developing plans on each Forest to make the rangers' work more effective. Already excellent results are being obtained, for the rangers as well as the higher officers have undertaken the problem with enthusiasm.

The following table shows the classification of the Forest force, including field men temporarily assigned to the district offices, on June 30, 1911:

Supervisors.....	151
Deputy supervisors.....	100
Rangers.....	1,424
Guards.....	526
Forest examiners and forest assistants.....	129
Timber and mining experts, engineers, land examiners, hunters, etc.....	112
Clerks.....	182
Total.....	2,624

To facilitate administration a number of Forests were divided into smaller units. Four new units were created by the partition of existing Forests upon which the amount of business has increased to such an extent as to necessitate a reduction in the area, with small additions of territory which has been found to be more valuable for forest purposes than for other use. These new units are the Tusayan, in Arizona, which comprises a portion of the Coconino Forest and 74,356 acres of newly added territory; the Kern, in California, which is made up of a portion of the Sequoia Forest and 12,663 acres of new territory; the Eldorado, in California and Nevada, which comprises a portion of the Tahoe Forest, together with 31,710 acres of new territory; and the Palisade, in Idaho and Wyoming, formerly a part of the Targhee Forest. The San Luis Forest, in California, was merged with the Santa Barbara Forest, following a large elimination which reduced its area to such an extent as not to warrant separate administration. The San Juan Forest, in Colorado, the Black Hills Forest, in South Dakota, and the Chelan Forest, in Washington, were administered in two separate

units, owing to an increased volume of business in these Forests. On the other hand, on account of the undeveloped character of the Forest areas, the Choctawhatchee and Ocala Forests, in Florida, and the Michigan and Marquette Forests, in Michigan, were administered as single units. The Luquillo Forest, in Porto Rico, is not under administration, because of the large amount of alienated land and of land the title to which is in question within its boundaries. A new Forest, called the Santa Rosa National Forest, was created from public lands in Nevada not hitherto within Forest boundaries. The net result is that 153 units were under administration within the limits of the United States, as against 147 at the end of the last fiscal year, and the average Forest area was reduced from 1,129,957 acres to 1,070,545 acres.

THE NATIONAL FORESTS.

AREA AND BOUNDARIES.

The total area within the boundaries of the National Forests was decreased during the year by presidential proclamations which eliminated 4,598,705 acres and added 2,806,267 acres. These additions and eliminations were made as a partial result of the field examinations carried on during the past two years. Additional changes, not shown in the area table on page 10, became effective on July 1, 1911, adding 364,480 acres and eliminating 84,969 acres. Further additions and eliminations, amounting to approximately 619,000 acres and 1,128,000 acres, respectively, are still pending.

The policy which has governed recommendations for additions and eliminations, as agreed upon by the Secretary of Agriculture and the Secretary of the Interior February 7, 1910, and later approved by the President, is as follows:

(1) Lands wholly or in part covered with brush or other undergrowth which protects streamflow or checks erosion on the watershed of any stream important to irrigation or to the water supply of any city, town, or community, or open lands on which trees may be grown, should be retained within the National Forests unless their permanent value under cultivation is greater than their value as a protective forest.

(2) Lands wholly or in part covered with timber or undergrowth, or cut-over lands which are more valuable for the production of trees than for agricultural crops, and lands densely stocked with young trees having a prospective value greater than the value of the land for agricultural purposes, should be retained within the National Forests.

(3) Lands not either wholly or in part covered with timber or undergrowth, which are located above timber line within the Forest boundary or in small bodies scattered through the Forest, making elimination impracticable, or limited areas which are necessarily included for a proper administrative boundary line, should be retained within the National Forests.

(4) Lands not wholly or in part covered with timber or undergrowth, except as provided for in the preceding paragraphs, upon which it is not expected to grow trees, should be eliminated from the National Forests.

While it will doubtless be necessary in the future to make small additions and eliminations from time to time as conditions change, it is believed that the boundaries as now established or planned may be regarded as fairly stable.

As the National Forests consist largely of unsurveyed lands the gross area figures are subject to corrections. A revised estimate adopted January 1, 1911, reduced the apparent area of the Forests 530,516 acres, as shown by States in the following table. The changes of area due to additions and eliminations, the amount of alienated lands within the Forests, and the net area—that is, after deduction is made of the lands eliminated—are also shown. Lands covered by patents issued or pending are classed as alienated. They include as their principal items the following: Railroad selection lists pending, 1,273,360 acres; homestead entries, original, 1,138,550 acres; State selections, including school, 670,086 acres.

National Forest areas, in acres, by States.

State or Territory.	Gross area June 30, 1910.	Addi- tions.	Elimina- tions.	Correc- tions Jan. 1, 1911. ¹	Gross area June 30, 1911.	Alienated area.	Net area June 30, 1911.
Arizona.....	15,214,745	512,065	915,665	+ 86,855	14,898,000	1,014,548	13,883,452
Arkansas.....	3,189,781	40	964,242	+ 311	2,225,890	1,041,878	1,184,012
California.....	27,968,510	732,378	883,400	- 82,033	27,735,455	6,631,386	21,104,069
Colorado.....	15,491,791	.....	641,967	- 87,924	14,761,900	1,353,762	13,408,138
Florida.....	674,891	.....	.....	+ 79	674,970	356,010	318,960
Idaho.....	19,963,171	5,695	72,842	-252,669	19,643,355	1,503,920	18,139,435
Kansas.....	302,387	.....	.....	+ 1,550	303,937	147,561	156,376
Michigan.....	163,373	.....	.....	+ 398	163,771	79,760	84,011
Minnesota.....	1,204,486	.....	.....	+ 264	1,204,750	360,277	844,473
Montana.....	19,474,696	.....	114,575	- 55,021	19,305,100	3,112,596	16,192,504
Nebraska.....	556,072	.....	.....	+ 628	556,700	35,635	521,065
Nevada.....	5,109,415	647,838	97,823	- 9,083	5,650,347	226,093	5,424,254
New Mexico.....	11,140,123	608,884	742,776	+105,069	11,111,300	1,300,778	9,810,522
North Dakota.....	13,940	.....	.....	20	13,920	7,696	6,224
Oklahoma.....	60,800	1,204	360	- 4	61,640	612	61,028
Oregon.....	15,920,822	.....	.....	+228,078	16,148,900	2,408,761	13,740,139
South Dakota.....	1,294,440	.....	.....	- 6,740	1,287,700	213,940	1,073,760
Utah.....	7,411,157	298,163	78,318	+ 36,553	7,667,585	465,890	7,201,695
Washington.....	12,007,340	.....	17,610	-305,050	11,684,680	1,770,366	9,914,314
Wyoming.....	8,941,681	.....	56,327	-191,811	8,693,543	273,046	8,420,497
Total in United States.....	166,103,621	2,806,267	4,585,905	-530,540	163,793,443	22,304,515	141,488,928
Alaska.....	26,761,626	.....	12,800	+ 24	26,748,850	105,590	26,643,260
Porto Rico.....	65,950	.....	.....	.....	65,950	32,975	32,975
Grand total.....	192,931,197	2,806,267	4,598,705	-530,516	190,608,243	22,443,080	168,165,163

¹ Due to new computations of acreage, as explained in the text above.

CLAIMS AND SETTLEMENT.

Still further alienations will, of course, take place. Many claims which antedate the creation of the Forests remain to be perfected; claims may still be initiated under the mining laws, and listing of areas for settlement continues wherever the land is found to be more valuable for agriculture than for forest purposes.

While the Forest Service does not obstruct or desire to prevent the patenting of any valid claim, it cooperates with the General Land Office to protect the Government against illegal claims by making field examinations on notification that patent is sought. This cooperation has worked well. The procedure in claims cases was greatly simplified and delays were obviated by the adoption in November, 1910, of the method set forth under "Work for the ensuing year" in

last year's report, whereby reports on claims are submitted by the district foresters directly to chiefs of field division of the General Land Office. When it appears necessary to contest a claim, the district assistant to the Solicitor of the Department of Agriculture considers the evidence submitted by the Forest Service field examiner, and the law involved; and, if satisfied that a contest should be initiated, frames the charges to be recommended to the chief of field division. The latter decides whether or not a hearing shall be ordered.

In examining mineral claims the procedure followed is so planned as not to interfere with legitimate mineral development. Reports on mining claims are made to the General Land Office only when patent is applied for, or when the land is held for purposes other than mining and the claim is interfering with the administration of the Forest. On notification that patent to National Forest land is sought under the mining laws a forest officer makes an examination and, if he finds that the claim is apparently held in good faith for mining purposes and its location is such that the issuance of patent will not prejudice National Forest interests, his recommendation is favorable. When he finds that the claim is located on land valuable for its timber, or which has a high value for purposes other than mining, an examination is made by a mining expert to determine whether the mineral law has been fully complied with. Adverse recommendations are never made to the General Land Office except upon the report of such mineral experts.

To supply the Forest Service with a sufficient force of properly qualified men the Civil Service Commission held an examination and established a register of eligibles designated as mineral examiners.

Field examinations of claims furnished a basis for reports to the General Land Office as follows:

Reports to the General Land Office on unpatented claims.

Character of action.	Home- stead entry.	Desert land entry.	Timber and stone entry.	Mineral entry.	Coal entry.	Miscella- neous.	Total.
Favorable.....	1,418	31	220	1,049	207	22	2,947
Unfavorable.....	395	18	32	157	18	6	626
Total.....	1,813	49	252	1,206	225	28	3,573

Action upon claims to National Forest land before the Department of the Interior resulted as follows:

Claims to National Forest land disposed of by the Department of the Interior.

Character of report.	Home- stead entry.	Desert land entry.	Timber and stone entry.	Mineral entry.	Coal entry.	Miscella- neous.	Total.
Patent issued.....	935	21	325	700	19	7	2,007
Canceled.....	626	17	15	183	53	4	898
Total.....	1,561	38	340	883	72	11	2,905

The applications for and listing of National Forest lands for homestead entry under the act of June 11, 1906, are shown in the following table. The total acreage listed since the passage of the law was at the close of the year 943,718 acres, as against 632,412¹ acres at the close of the previous year. Since the fiscal year ends in the midst of the field season, and since there is always an accumulation of applications during the winter months when field examinations are in most regions impossible, the number of applications awaiting final action is not typical of the actual state of the work. By the close of the field season the work will be practically up to date.

Applications and listings for Forest homestead entry.

Fiscal year—	Number of applications during year.	Awaiting final action at close of year.	Number of tracts listed during year.	Acreage listed during year.
1911.....	5,349	2,984	2,962	311,306
1910.....	5,216	4,193	1,751	¹ 188,751

¹ Corrected figures. The total given in the report for 1910 failed to include 5,106 acres listed on the Wichita Forest and 434 acres on Forests in Colorado and Wyoming. The total area listed to June 30, 1910, was 632,412 acres instead of the 626,872 acres reported a year ago.

The above table shows that the number of tracts listed last year was about 70 per cent greater than in 1910. At the present time the areas listed for settlement under the Forest homestead act exceed a total of 1,000,000 acres, undoubtedly the cream of the land suitable for agriculture. Over 8,000 settlers have thus been provided for.

COST AND USE.

The following tables show the gross cost of administration and protection, expenditures for permanent improvements, and receipts from the several sources, both in totals and per acre, during the year, as compared with those for the fiscal year 1910. The per-acre expenditures and receipts are computed on the basis of the gross area of all National Forests under administration at the close of the year, since the cost of administration is not materially lowered by private holdings within the Forests.

Expenditures for administration and protection and permanent improvements during the fiscal year 1911, compared with 1910.

	Administration and protection.		Permanent improvements.	
	Total.	Per acre.	Total.	Per acre.
1911.....	\$5,335,886.97	\$0.02766	\$273,634.42	\$0.00142
1910.....	3,752,316.91	.01894	593,835.64	.00310

¹ Corrected figures. See note under table.

Comparison of receipts from the several sources for fiscal years 1911 and 1910.

Fiscal year—	Timber.		Grazing.		Special uses.		All sources.	
	Total.	Per acre.	Total.	Per acre.	Total.	Per acre.	Total.	Per acre.
1911.....	\$1,014,769.84	\$0.00526	\$935,490.38	\$0.00491	\$76,645.93	\$0.00040	\$2,026,906.15	\$0.01065
1910.....	1,043,428.20	.00541	986,909.38	.00512	59,810.50	.00031	2,090,148.08	.01084

Refunds of excess deposits (as, for example, deposits made by buyers of timber in advance of cutting) have not been deducted from the receipts given above. The refunds of timber receipts in 1911 amounted to \$48,176.43 and of all receipts to \$57,912.73. A deduction of the refunds would leave the total of receipts for 1911 \$1,968,993.42, as against \$2,041,181.22 for 1910. These figures show a decline in total receipts of \$72,187.80. The decline in receipts from timber, after deducting refunds, was \$45,249.97, and from grazing \$42,004.45, while from special uses there was a gain over the previous year of \$15,066.62.

The reasons for the decreased receipts from timber and grazing are explained in detail under the heads of "Forest management" and "Range management." The salient facts are: (1) That in both timber sales and grazing use fluctuations of the receipts take place in response to business conditions affecting the lumber and live-stock industries; (2) that the National Forest range is now utilized, in most regions, substantially up to its capacity and no considerable increase in receipts from grazing is to be anticipated while the charge for the grazing privilege remains on the present basis; and (3) that only a very small part of the merchantable timber on the National Forests has as yet come into demand, and increase in the income from the sales of timber depends primarily on the rate at which the upbuilding of the West develops better markets and transportation facilities.

The lumber industry has never made full recovery from the depression which followed the panic of 1907. The improvement manifest in the period covered by the fiscal year 1910, and reflected in increased receipts from National Forest timber sales in that year, was checked early in the fiscal year 1911; and to the unfavorable effects of a general business policy of retrenchment and economy was added the depressing influence of overproduction of lumber in the Northwest. Nevertheless, receipts from timber sales in 1911 were within 3 per cent of what they were in 1910, while contracts of sale for timber to be cut in the near future disposed of 45 per cent more timber than was sold in 1910. Sales under existing contracts practically assure a substantial gain in receipts for 1912.

The fact that for a year in which receipts from the Forests declined about 3 per cent, the gross expenditures for administration, protection, and improvement showed an increase over the previous year, raises the question whether this accords with good business policy, and also the question whether the net cost of the Forests to the Government year by year ought not to be growing less.

The cost of the National Forest work may be analyzed into: (1) Expenditures necessary to provide for present use; (2) expenditures in connection with claims and the listing of land for settlement; (3) expenditures to protect the standing timber, young growth, and

water-holding power of the Forests from harm; (4) expenditures to equip the Forests with the things required to facilitate use and protection; and (5) expenditures for investigations, designed to promote better use.

Of these only the expenditures of the first class are to be regarded as the cost of doing current business; and since a part of current business is free use, the cost of doing the business which yields receipts is less even than the total expenditures in this class. By stopping all work other than that involved in making and supervising timber sales, regulating grazing, and handling special uses for which payment is made, the Forests could easily be made to show a net profit to the Government, even with the charge for grazing left, as at present, far below the commercial value of the privilege. Such a policy would, however, lessen the public benefits which the Forests are yielding at the present time; it would entirely fail to provide for the best use of all kinds of land; it would expose to destruction by fire public property of enormous money value and incalculable future importance; it would fail to provide the means for making the natural resources of the Forests most serviceable. In other words, it would be a reversal of the entire policy which has underlain both legislation concerning the National Forests and the present administrative system. It would also be a serious business mistake.

The major part of what is spent on the Forests each year is an investment. Permanent improvements are like betterments made by a railroad to enable it to handle business at a lower cost. In the absence of proper equipment, operating expenses are increased. This is forcibly illustrated in the case of fire protection. Last year nearly \$1,100,000 was spent in wages for temporary employees hired to fight fires and for transporting, provisioning, and equipping them. While the natural conditions this season are very different from those faced last year, so that a close comparison of results is impossible, the extra expenses incurred in fire fighting will not exceed \$190,000; yet much better protection has been given. Every step forward in developing a good system of permanent improvements means a lower annual cost for fire protection. It is already evident that the increase in the permanent improvement fund expendable in 1912 will materially reduce the expenditures for fire fighting. Fires can now be discovered and reached more promptly, and consequently put out at less cost, than ever before. The total expenditures for all purposes in 1912 will probably fall slightly below the total for 1911; but because of the more highly organized and better equipped protective system the money will be spent to much better advantage.

Properly speaking, most of what is spent in protecting the Forests is also an investment. Any private owner of timber held for future sale would, as a matter of course, add his carrying charges to his original outlay as an increase in the capital tied up; and if he sees his property rising in value faster than the cost of carrying it, he knows that he is on the safe side. Since the National Forest timber is for the most part either on what may be called the fringe of present demand or quite beyond the zone of present operations, its value will for some years to come rise rapidly. The average rise in the stumpage price of timber sold by the Forest Service in the last four years has been 18 cents per thousand. An average annual increase of only 6 cents per thousand feet for the 518 billion feet of merchantable timber on the Na-

tional Forests (exclusive of Alaska) would be equivalent to \$31,000,000 added each year to the value of the present stand. There is also the increase which takes place through the growth of small timber. The Government can well afford, in consideration of the rising value of its property, to give it protection irrespective of what the Forests are now bringing in. It would be inexcusable folly to do otherwise.

If the expenditures of the Forests can not be curtailed, the natural query follows, Why can not the receipts be largely increased to meet the expenses? This could only be done by throwing large bodies of timber on the market at prices much below its real value. The market is now glutted through overproduction from private lands. To sell public timber when it is not really needed at prices below its value and under conditions which would be injurious to the Forest itself, thus sacrificing the great public reserve which will be badly needed later on, would be nothing less than a betrayal of the people's trust. The truth is that, regarded as public property, the National Forests form an aggregate so stupendous that the most conservative statements and estimates appear visionary. In consequence it is difficult to secure a consideration of questions of business policy on their actual merits where questions of value are involved. It cost the Nation no outlay of capital to reserve for public use timber which it would require an outlay approximately equal to the present national debt to buy; but that does not alter the actual situation. The pressure for throwing down the barriers which now prevent this great prize from passing into private hands is a natural result of this situation.

While the gap between expenditures and receipts can not be expected to close entirely for some years unless a shortsighted and false economy is attempted, there is every prospect that the net cost to the Government will decrease yearly. In the fiscal year 1912 the gross cost will probably be slightly less and the receipts somewhat greater than in 1911, and the estimate of appropriations needed for 1913 keeps within the total for 1912.

Although the receipts for timber and grazing fell off, the number of persons who made beneficial use of the Forests was greater than in any previous year. The total number of timber sales made (5,653) was 5 per cent above the number in 1910, the pay grazing permits issued were within one-third of 1 per cent of the number in 1910, the permits for free use of timber rose from 35,364 in 1910 to 40,660 in 1911, while the free special use permits fell from 2,986 to 2,844, but the pay special use permits rose from 2,222 to 2,301.

The most important development in the field of special uses was in connection with applications for the use of land for water-power purposes. The new form of permit and stipulation described in last year's report was approved on December 28, 1910. Its fairness was generally recognized, and the applications for permits which have been made show that preparations for local development of the water-power resource are now well under way. The following statement indicates the extent to which this has gone. It does not include noncommercial projects utilizing or contemplating the utilization of less than 1,000 horsepower.

Number of projects operating June 30, 1911.....	28
Number on which construction had been begun	12
Number for which permits had been issued.....	91
Number of permits issued in fiscal year 1911.....	49
Number of applications for permits received in 1911.....	75

Of the 91 permits included in this statement, 50 were for commercial use, and 61 of the applications here reported as received in 1911 were for commercial use.

It still remains true, however, that there is need for legislation to make possible the granting of term permits, revocable only for breach of the stipulations during a period of years sufficient to justify the financing of large enterprises. By direction of the President, representatives of the Agricultural and Interior Departments took up last winter the question of the legislation immediately needed to provide for the use of portions of the public lands by private companies for the generation and transmission of hydroelectric power. The Department of Agriculture was represented by the Forester, the Solicitor, and Mr. J. B. Adams, of the Forest Service. Recommendations were drawn up proposing a system of leases secured against interference through the location of claims under the public-land laws, with safeguards to protect the public against the speculative tying up of power sites, and with provision for a moderate charge based on the net horsepower capacity of the site. The report of the joint committee of the two departments was approved by their respective Secretaries and submitted to the President, who in turn gave it his approval. A bill along the line of the report was introduced into Congress by a member of the House Public Lands Committee. Other bills, advocated by representatives of some of the hydroelectric power companies, were also introduced. The latter embodied the principle of perpetual easements, without compensation proportioned to the value of the sites and without adequate safeguards of the public interest. No bill was reported to either branch of Congress at the last session.

FOREST MANAGEMENT.

STAND OF NATIONAL FOREST TIMBER.

The standing timber on the National Forests, including cordwood, is now estimated to be the equivalent of 518,000,000,000 board feet, exclusive of Alaska. In 1910 a total stand of 530,000,000,000 feet was reported. The shrinkage is due in part to the loss from forest fires in the summer of 1910 and in part to the corrected data. Reliable estimates of the timber on the National Forests in Alaska have not been obtained. A rough approximation, however, credits these Forests with a stand of 69,000,000,000 feet.

THE TIMBER SALE POLICY.

The stock taking of National Forest resources as a basis for scientific forest management, and particularly a more exact inventory of the standing timber, has progressed as rapidly as funds and men could be spared for this work. First consideration has been given to Forests where the demand for timber is greatest and overcutting most likely to occur. In 1908 a systematic plan of timber reconnaissance was adopted and put into effect on a small scale. This work has since been extended into all of the districts and is now nearly complete on a few Forests where information of this character is most critically needed. Up to the present time the reconnaissance of 8,658,983 acres on an intensive basis, including detailed timber esti-

mates and accurate maps on a large scale, has been completed. Of this amount 3,900,824 acres were covered during the last fiscal year. In addition, reconnoissance of a less detailed character, designed to determine only the broader conditions in respect to topography and the amount and character of the timber, has been conducted on 17,174,251 acres.

The reconnoissance of each Forest or portion of a Forest is designed to furnish the basis for a working plan, or systematic scheme of management, for the area covered. Such working plans include, among other facts necessary to place the administration of the Forest upon the best practicable basis, the amount and location of stands of dead or overripe timber whose immediate cutting is advisable; the annual production of wood, as indicating the amount which may safely be cut each year without impairing a sustained yield of equal amount in future years; the stand of timber on desirable logging units, together with the topographic factors affecting their exploitation and market value; and the location and extent of areas where artificial reforestation is necessary. It is the aim of the Service to place each Forest as rapidly as possible under a systematized plan of management based upon information of this character.

The single factor of greatest importance in such working plans is the determination of the amount of timber which may safely be cut from each Forest annually without exceeding the annual production of wood. This is expressed in the maximum cut prescribed by the Secretary of Agriculture for each Forest each fiscal year. Up to the present it has been necessary to determine the annual cut in the majority of cases by a rough approximation based upon the area of the Forest and its stand of merchantable timber. As intensive reconnoissance covers new areas, much more reliable data concerning the rate of growth of the various species, the areas of young timber where the production of wood is at its maximum, and the like, are being secured and applied directly in fixing the maximum cut prescribed for the Forest in question. The maximum annual cut as determined by scientific data of this character represents, therefore, the interest on the National Forest timber viewed as a public security administered so as to maintain its present value for all time; in other words, the current yield which may be safely utilized without depleting the stock of material on hand. As established for the past year, the total amount which could properly be cut annually from all Forests is 3,273,690,000 board feet.

In the timber-sale policy of the Service provision is first made for local needs, present and future, and sales of timber which will enter into the general markets are considered only when it is clear that an excess over the permanent supply required by local industries exists. The application of this policy is indicated in the following statement showing the number of sales made of various amounts during the year.

Number of timber sales classified according to amount of sale.

State or Territory.	Under \$100.	\$100 to \$500.	\$500 to \$1,000.	\$1,000 to \$5,000.	Over \$5,000.	Total number of sales.
Arizona.....	609	10	2	1	1	623
Arkansas.....	21	7	3	6	2	39
California.....	506	24	2	6	5	543
Colorado.....	782	53	13	16	4	868
Florida.....	7					7
Idaho.....	552	42	12	6	6	618
Minnesota.....		3		1		4
Montana.....	1,137	59	15	9	3	1,223
Nevada.....	202	3				205
New Mexico.....	241	8	3	4	5	261
North Dakota.....	2					2
Oklahoma.....	38					38
Oregon.....	210	5	2	3	3	223
South Dakota.....	159	11	1	3	1	175
Utah.....	287	10	3	4	2	306
Washington.....	49	25	6	6	6	92
Wyoming.....	132	7	2	2	2	145
Alaska.....	210	60	6	5		281
Total for fiscal year 1911.....	5,144	327	70	73	39	5,653
Total for fiscal year 1910.....	4,925	269	70	96	38	5,398

It will be noted that nearly 97 per cent of the sales of the past year were under \$500 in amount, and that the increase in sales over those during the fiscal year 1910 was almost wholly confined to the smaller transactions.

Aside from provision for permanent needs of localities dependent upon National Forests for their supplies of timber, primary consideration is given to the silvicultural needs of the Forests themselves and the utilization of material whose removal will be of benefit. The sale of merchantable dead timber and stands of overripe timber in which decay equals or exceeds the growth, and the cutting of mature trees from stands where their removal will greatly increase the growth of the remaining forest, are essential to accomplish this object. This policy not only makes possible additional revenue through sales of timber for the general market, in excess of local needs, but actually increases the amount of wood being produced on the Forests, puts the productive capacity of the soil to better use, and insures larger supplies of timber for the future.

In fixing the annual cut the limit is set with reference to the amount of timber which can be secured as a sustained yield from individual Forests or groups of Forests which form well-defined economic units. In view of the general conditions in regard to timber supply in the United States and the rapid exhaustion of the stands of timber in private ownership it appears advisable to go even further than this in restricting the immediate cut from the National Forests, and to reserve additional supplies of forest products in order to assist in tiding the country over the period of economic readjustment which must inevitably ensue when the main supplies of timber outside of Government ownership are exhausted. To a certain extent no other course is open now, for only a small fraction of the total amount which is being produced annually on many of the Forests by growth can be sold under present conditions. But as a broad public policy it would seem advisable for the Government to accumulate a surplus stock against the time when the demand for forest products, in view of the rapidly diminishing supply, will be one of the most critical economic conditions confronting the country.

The application of this policy will not prevent sales of National Forest timber to an amount sufficient to make the Forests self-supporting. If only one-half of the total annual cut of 3,273,690,000 feet, which it is estimated could be removed without reducing the permanent stock on the Forests, were sold each year at the average price obtained in the sales of the past fiscal year, leaving the other half to accumulate as a reserve supply, the income from this source would exceed \$4,000,000 annually. The timber cut during the year under both timber sales and free-use permits, aggregating 498,166,000 board feet, was but a little over 15 per cent of the total annual cut established as representing the actual yield of the Forests.

The specific policy adopted, therefore, has been to increase the volume of timber sales, as business conditions permit without an undue sacrifice of stumpage value, up to an amount which will, in connection with receipts from other sources, put the National Forests upon a self-supporting basis. To go beyond this at the present time does not appear advisable in view of the need of accumulating reserve supplies of timber to draw upon when the supplies in private hands shall be largely exhausted.

That it will be practicable in pursuance of this policy to place the National Forests on a self-supporting basis is indicated by the results obtained on a number of Forests where, because of the presence of local industries which consume large amounts of timber annually or of transportation facilities which make possible the logging and manufacture of Government timber for the general market on a large scale, the sales have been much larger than on the great majority of Forests, which are still undeveloped in these respects. The following table shows the receipts and disbursements and the proportionate amount of receipts from timber sales on four such Forests where local conditions not only have made self-support possible but have resulted in a substantial net revenue after meeting the cost of administration.

Receipts and disbursements on certain Forests.

Forest.	State.	Receipts from sales of timber.	Total receipts.	Cost of administration. ¹	Net revenue.
Bitterroot.....	Montana.....	\$60,035.55	\$62,198.23	\$29,436.62	\$32,761.61
Deerlodge.....	do.....	77,672.53	85,537.68	41,864.27	43,673.41
Coconino.....	Arizona.....	51,257.16	70,303.12	40,991.24	29,316.88
Piomas.....	California.....	31,707.23	39,401.93	37,061.11	2,340.82

¹ Exclusive of permanent improvements.

Another fundamental feature of the sale policy of the Service, which directly affects the amount of timber sold and the receipts from this source, is the maintenance of stumpage prices at figures representing the actual value of the standing timber under normal market conditions as closely as it is practicable to determine it. This value is based upon market prices of the products manufactured from the timber during normal conditions, stumpage rates being determined by deducting the cost of logging and manufacture and a reasonable percentage of profit from the sale value of the product in the form prepared for final consumption. The Service has consistently refused to make sales at a sacrifice in what is believed to be the value of its

standing timber during normal conditions and to depreciate the value of its stumpage by lowering prices to meet temporary fluctuations in the lumber market. The great body of National Forest timber is looked upon as a public security which it is the duty of the Service to maintain at par value, a value which should increase as the supply from other sources is lessened and which protects the public interests represented in these national holdings. Since 1907 a general depression, more or less acute in different portions of the West, has prevailed in the lumber market. A reduction in stumpage prices adapted to depreciated lumber prices would have materially increased National Forest sales during this period.

At the cost of a considerable sacrifice of receipts the Service has declined to make sales under such conditions, believing that the interests of the people in the National Forests, both as joint owners of the property which these Forests represent and as consumers of lumber, require the withholding of timber from the market until more favorable terms could be secured. In fact, the timber sold last year brought a higher price than during the preceding fiscal year, the average rate being \$2.56 per thousand feet in 1911, as compared with \$2.44 in 1910. The timber cut during the year paid an average stumpage price of \$2.25 per thousand feet, as compared with \$2.36 in the fiscal year 1910, this difference being due to increased operations under some of the older contracts which made lower rates.

The requirement of methods of logging which wherever possible leave the basis for a second cut of timber on the ground, and which in all cases will insure the protection of the cut-over area and its speedy restocking with forest growth, is another essential feature of the sale policy of the Forest Service which should not be sacrificed in order to sell more timber. In many instances a third of the merchantable stand is reserved, consisting of younger and thriftier timber, as a basis for a second cut within a maximum period of 50 years. In other cases where this is not practicable the restocking of the ground is insured by the reservation of a sufficient number of seed-bearing trees and careful protection of the seedling and sapling growth on the area. In all sales adequate protective measures are enforced, either by piling and burning slash resulting from cutting on the entire tract or by constructing fire breaks around the sale area and burning the slash clean within these breaks. Close utilization of all merchantable material in the trees cut is insisted upon. These measures are essential to the perpetuation of the timber supply on the Forest areas where cutting is permitted, the establishment of definite standards of conservative lumbering, and the elimination of the wasteful use of forest products. The requirements of National Forest timber contracts in these respects, while framed to meet the methods of logging necessary in each locality, should be such as will not only amply protect the future forest resources on the public holdings, but also establish standards of forestry practice which will sooner or later be applied to private timberlands.

The prevention of monopoly in the timber-sale policy of the Service has been constantly enforced. It has been found, however, that the application of this policy is not inconsistent with sales of large amounts of timber under comparatively long cutting periods in localities where there is little or no local demand and the timber must, if used at all,

be sold in the general markets of the country. A vast proportion of the National Forest timber is inaccessible to present transportation. To exploit such bodies, large investments in railroads, flumes, or other transportation facilities are needed. Such investments by business interests are not practicable unless the amount of timber covered by the contract of sale is sufficient to reduce the investment per unit of manufacture to a reasonable figure. In accordance, therefore, with the policy of increasing timber sales sufficiently to make the National Forests self-supporting, larger sales than formerly are being made of bodies of inaccessible timber not needed for local use. It may be advisable to make sales under such conditions for amounts of one-half or three-fourths of a billion feet, with cutting periods of 10 years or perhaps more, as determined by the rate at which logging operations can be practically conducted. In every sale of this character provision will be made for the periodic readjustment of stumpage prices in conformity either with stated increases specified in the contract, with prevailing prices secured for similar National Forest timber at the date of readjustment, or with the market value of the manufactured product at the date of readjustment. Because of the physical conditions which control the exploitation of the great bulk of National Forest timber, it is from sales of this character that the Service is likely to secure in the immediate future substantial increase in the total volume of its business. The fact that the construction of railroads or other transportation facilities, an essential feature of such contracts, enhances the value of other bodies of timber and develops the entire country to a marked degree is a further reason for the adoption of this policy.

SALES OF THE YEAR.

The undeveloped condition of most of the National Forests and the lack of information concerning their timber resources and the opportunities for purchases of stumpage in many of the principal lumbering centers of the country have made it advisable for the Service to take more definite and aggressive steps to bring desirable sales to the attention of possible purchasers. This is being done through the publication of descriptive material in lumber and trade journals and through the personal efforts of members of the Service. The latter method has been taken up primarily to assist in the disposal of bodies of fire-killed timber, which is in danger of becoming a total loss through rapid deterioration. It is probable that these methods will assist materially in the sale of bodies of National Forest timber whose removal is most urgent.

The more important factors influencing the sale of timber are: (1) The distance of the larger bodies of National Forest timber from markets and from existing transportation facilities, and the cost of constructing necessary improvements to exploit such bodies, usually under rugged, mountainous conditions; (2) difficulties in logging, particularly the rough surface usually encountered and the short seasons of practicable logging due to the elevation at which most of the National Forest timber occurs; (3) the condition of the lumber markets, which are usually very sensitive to general business conditions, and which in many portions of the West are in danger of constant overproduction through the manufacture of bodies of timber, developed by large investments, in excess of the current

demand; and (4) the presence of privately owned timber tributary to the same markets and usually more accessible and of better quality than the Government timber. As a rule the greater part of the privately owned timber tributary to a given market must be removed before there is any considerable demand for National Forest timber. The cost of marketing National Forest timber usually exceeds that of privately owned timber because of its inaccessibility and the rougher logging conditions.

The requirements imposed in Service contracts for the perpetuation of the Forest increase the cost of operation, as a rule, by 5 to 10 per cent as compared with similar operations upon private lands. To offset this disadvantage there are certain distinct advantages to the purchaser of Government timber. These consist in the elimination, in large part, of fire risk because of the protection furnished by the Government, the small deposits required in advance of cutting, and the elimination of taxes and other carrying charges necessary where bodies of privately owned timber are controlled for similar periods. The realization of these advantages by the lumber trade is a significant factor which in many localities will tend to increase sales of National Forest timber, even though stumpage prices may be somewhat higher than in the case of privately owned timber and the cost of operation somewhat greater.

The condition of the timber-sale business during the year is indicated by the following statement of timber sold and timber cut under sales, with the value of each, by States:

Timber sold and cut under sales on the National Forests, fiscal year 1911.

State or Territory.	Timber sold.		Timber cut under sales.	
	Amount.	Value.	Amount.	Value.
	<i>Board feet.</i>		<i>Board feet.</i>	
Arizona.....	90,876,000	\$280,028.27	37,858,000	\$102,880.54
Arkansas.....	13,458,000	29,472.71	4,817,000	10,626.97
California.....	112,438,000	295,536.22	37,899,000	80,243.65
Colorado.....	59,075,000	115,878.01	47,647,000	96,110.62
Florida.....	55,000	44.00	32,000	18.75
Idaho.....	44,576,000	94,010.62	49,597,000	118,472.26
Minnesota.....	473,000	1,313.46	647,000	2,481.82
Montana.....	144,605,000	485,758.79	57,642,000	170,276.49
Nevada.....	2,278,000	5,108.95	2,539,000	5,207.79
New Mexico.....	21,225,000	51,944.90	20,096,000	36,594.57
North Dakota.....	1,000	7.50	1,000	6.30
Oklahoma.....	37,000	79.20	37,000	79.20
Oregon.....	134,245,000	332,242.52	22,446,000	42,158.93
South Dakota.....	10,326,000	29,174.53	10,056,000	27,496.65
Utah.....	15,167,000	38,295.08	12,275,000	28,498.69
Washington.....	142,776,000	305,748.48	25,343,000	48,368.20
Wyoming.....	9,796,000	27,692.27	17,598,000	43,265.39
Alaska.....	28,897,000	30,203.54	28,148,000	30,206.07
Total fiscal year 1911.....	830,304,000	2,122,539.05	374,678,000	842,992.89
Total fiscal year 1910.....	574,555,000	1,400,992.69	379,616,000	896,308.34

The total value of the timber cut under sales as given above differs from the receipts from timber as given on page 353, both because the latter includes the receipts from timber and fire trespass and because payment for timber is required in advance of cutting.

The sale of turpentine from the Florida National Forest yielded \$8,268.68, as compared with \$4,238.50 for the preceding year.

The year was characterized by a marked depression in the lumber markets of many portions of the West, a depression resulting in several localities in prices for manufactured lumber of from \$2 to \$3 per thousand board feet less than those of 1906 and 1907. This depression was most acute on the northern Pacific coast, in the Douglas fir belt, where practically no additional sales were made and operations under several existing sales were suspended owing to the inability of the purchasers to market their product. This depression also affected seriously the demand for National Forest timber in the Douglas fir and lodgepole pine belt of the northern and central Rocky Mountains, from which considerable quantities had previously been sold for local uses, mining timbers, railroad crossties, and timbers for structural purposes. The general suspension of construction work by many railroads and the reduction in output on the part of various mining and manufacturing companies have reduced the demand for National Forest timber and even made it difficult or impossible to continue operations under some old sales.

The demand for pine timber on the National Forests of western Montana, northern Idaho, and eastern Oregon, and in the Sierra Nevada Mountains of California, Arizona, and southern Colorado, has remained fairly firm. This material has felt the general depression relatively less, because it is in good demand in the general market and has a considerable variety of uses. A number of additional sales were made on these Forests, and the bulk of the year's cut was confined to them. The operations in the pine forests mentioned, together with sales supplying primarily local industries less affected by general market conditions, kept the cut very close to that during the preceding fiscal year, the difference being less than 5,000,000 feet.

In spite of the poor market conditions an anticipated revival of more active demand resulted in a marked increase in the amount of timber sold, as compared with the preceding year, an increase amounting to 44.5 per cent in the quantity and 51.5 per cent in the value of the material disposed of. The policy adopted during the year of making sales for larger amounts and longer cutting periods where the investment necessary called for this course was an important factor in the increase in sales.

The disastrous fires of 1910 had the immediate effect of canceling two large sales in western Montana and northern Idaho, covering areas where a large portion of the timber was killed. This in itself caused a reduction in timber-sale receipts of from \$50,000 to \$100,000 during the year.

Twenty-three per cent of the timber cut and 11 per cent of the timber sold was fire-killed material. Including one sale of 100,000,000 feet, previously reported sold as green timber, but resold during the year as fire-killed, 21 per cent of the total amount sold was dead timber. The effort to dispose of the stands of fire-killed timber resulted in the sale of approximately 190,000,000 feet subsequent to the close of the fiscal year. The inaccessibility of much of the fire-killed timber will prevent its disposal before it becomes unmerchantable, but every possible effort will be made to salvage the maximum amount of this material. In some instances the efforts of the Service to dispose of the dead timber have been very successful. On the Pike National Forest in Colorado, for example, sales during the past

five years have removed over 50 per cent of the dead timber from an area of approximately 350,000 acres.

The chief obstacle to making additional sales has been the refusal of many applicants to pay the appraised value of the timber. Other sales have not been consummated because of the unwillingness of purchasers to comply with the requirements imposed by the Service for the protection and perpetuation of the forest. As indicated above, however, a more lenient policy in these respects is considered advisable in view of the duty of the Service to maintain stable values for National Forest timber and to regulate the cuttings so that the objects of the National Forests will be carried out.

TIMBER TRESPASS

The receipts for the year included \$43,236.37, paid in settlement for timber cut in trespass, and \$14,371.16 paid in settlement of fire trespass, the greater portion of which was for the destruction of merchantable timber and young forest growth. The receipts from these sources during the year 1910 totaled \$35,755.55.

FREE USE.

The following table summarizes the free-use business of the service during the past year:

Free use of timber on National Forests, fiscal year 1911.

State or Territory.	Number of permits.	Quantity.	Value.	State or Territory.	Number of permits.	Quantity.	Value.
		<i>Bd. ft.</i>				<i>Bd. ft.</i>	
Arizona.....	1,955	4,729,000	\$12,211.92	Oklahoma.....	232	137,000	\$300.00
Arkansas.....	103	480,000	1,472.88	Oregon.....	2,383	11,331,000	15,582.78
California.....	3,085	9,197,000	17,359.02	South Dakota.....	1,401	5,855,000	7,350.57
Colorado.....	4,025	12,246,000	20,625.25	Utah.....	4,677	11,656,000	16,249.96
Florida.....	16	29,000	39.45	Washington.....	621	2,851,000	4,790.10
Idaho.....	7,150	21,523,000	31,797.32	Wyoming.....	1,652	6,852,000	8,952.79
Michigan.....	2	12,000	6.00	Alaska.....	7	100,000	108.95
Minnesota.....	7	87,000	313.65				
Montana.....	8,152	19,403,000	38,576.67	Total for fiscal year 1911.....	40,660	123,488,000	196,930.24
Nevada.....	496	1,799,000	2,950.52	Total for fiscal year 1910.....	35,364	104,796,000	176,166.51
New Mexico.....	4,442	15,149,000	18,170.71				
North Dakota.....	192	52,000	71.70				

The amount of timber cut under free-use permits was 22.8 per cent of the total cut for the year.

The policy pursued with regard to permitting the free use of National Forest timber has followed closely that of the past, this privilege being accorded residents in or near the National Forests who need material for personal use, and who can not reasonably be expected to purchase. Special consideration is given to new settlers and prospectors for minerals. Free use is also granted on a liberal scale for cooperative enterprises and public purposes. In granting free-use permits, dead timber is first disposed of wherever available and suitable for the needs of the applicant. Approximately three-fourths, or 91,956,000 feet b. m., of the material cut under free use during the past year was dead timber.

TOTAL CUT OF THE YEAR.

The total cut of National Forest timber last year, under both sales and free use, was 498,166,000 board feet, with a value of \$1,039,923.13, as against 484,412,000 board feet, with a value of \$1,072,475.25, in 1910. The falling off in value at the same time that the total quantity cut increased is due partly to the somewhat lower stumpage price obtained for the timber cut under sales, already pointed out on page 20, but more largely to the increased ratio of the cut under free use. Both because most of the free-use timber is dead and because the live free-use timber is often low-grade material desired for fuel, fencing, and similar purposes, its average stumpage value is much lower than that of the timber cut under sales. In 1911 this stumpage value was \$1.60 for the equivalent of 1,000 feet board measure, as against the \$2.25 obtained for timber cut under sale.

LOSSES BY FOREST FIRES.

THE FIRES OF 1910.

Since the fiscal year closes in the midst of what is, taking the National Forests as a whole, the fire season, the statistics of fire losses are compiled by calendar years. Seasonal variations in weather conditions produce wide differences in the risk for different years. The calendar year 1910 was exceptionally unfavorable. Throughout the West the winter snowfall and spring rains were unusually light, so that with the oncoming of summer the supply of surface moisture rapidly dried away, and an abnormal and steadily increasing number of fires followed. Through the summer the conditions of drought grew worse and worse, until in parts of the Northwest they became the most severe within the period of Weather Bureau records. Steady high winds were combined with almost complete failure of the light summer precipitation, which usually mitigates the severity of summer drought in the mountains. By the middle of August the Forest Service was straining every resource to hold in check, with a force entirely inadequate to the work, the multiplying fires.

Out of this situation there developed a national disaster. From the Pacific coast region eastward to central Montana the forests of the Northwest seemed suddenly to burst into flames. Fierce winds attained, in northern Idaho and western Montana, hurricane proportions. The scattered fires were driven together and lashed into fury, until they forced to shelter (where shelter could be found) the scattered bands of fire fighters. Within a few days' time the National Forests suffered losses which surpassed the total inflicted by all the fires of former years since Government protection of the Forests began.

The total area burned over within the National Forests was 4,134,253 acres, of which 3,078,109 acres were classified as timbered and 1,056,144 acres as open. These figures are in striking contrast with those for the calendar year 1909, in which 362,014 acres were burned over, of which 209,671 acres were timbered. The loss in 1910 in timber destroyed or damaged was 6,508,369,000 board feet, with an estimated value of \$14,889,724, as against 169,410,000 board feet, with an estimated value of \$297,275 in 1909. There was also a loss of reproduction valued at \$9,180,989 and of forage valued at \$114,382.

Including the losses on private lands within the National Forests, the total timbered area burned over was 3,805,572 acres, and the total estimated loss was \$26,597,228, as against \$456,246 in 1909. This shows the losses of the two years in a ratio of more than 50 to 1.

The total cost of fighting these fires, exclusive of the time of forest officers, was \$1,037,254.03, as against \$54,669.83 in 1909. An average of 25.87 acres per thousand acres was burned over, as against an average of 1.86 acres the previous year. The total number of fires reported was 5,201, of which 3,164 were confined to an area of 5 acres or less. Of these fires 1,704, or 32.76 per cent, were caused by railroad locomotives; 724, or 13.92 per cent, by lightning; and 668, or 13.23 per cent, by campers. Incendiarism and brush burning were each responsible for a little less than 6 per cent of the fires; sawmills and donkey engines, for a little less than 1 per cent; and other causes, classed as miscellaneous, for 4.63 per cent. Finally, 1,184 fires, or 22.77 per cent of the total, were due to unknown causes.

The percentage due to lightning was unusually high. The exposure of forests to fires caused by lightning is the result of climatic conditions peculiar to the West, and is most serious in the high mountains. In other parts of the United States a thunderstorm brings with the lightning an antidote for fire, in the rainfall which accompanies an electrical storm. Many of the western storms, however, are characterized by violent lightning with little rain, and lightning often strikes where there is no rain at all. If the woods are unusually dry, the number of fires set will be correspondingly increased. Inasmuch as the regions most exposed to this danger are those which it is most difficult to protect because of their remoteness and the absence of means of communication, the danger of fires caused by lightning must always remain formidable while large parts of the Forests remain in an undeveloped state.

It is necessary to report, with deep regret, that a heavy loss of life took place in the fight against the fires of the calendar year 1910. That the losses were not much greater is due to the coolness, woodcraft, and devotion to duty of the forest officers, usually rangers, who brought their men through safely, even at imminent risk to themselves. The work of some of these forest officers may fairly be called heroic.

The names of the temporary employees of the Forest Service whose lives were lost, so far as they are known, appear in the list given on page 27. No forest ranger or other officer in the regular employ of the Forest Service lost his life, though several were badly injured.

1. George Smith.	27. W. Polk.	53. Joe Beauchamp.
2. G. A. Blodgett.	28. William Casey.	54. Roderick Ames.
3. Oscar Weigert.	29. James Kerr.	55. Tony Butcher.
4. Harry Jackson.	30. Gus Johnson.	56. Chris Omiso.
5. L. Ustlo.	31. W. Flynn.	57. C. Buck.
6. James Donahue.	32. Sam Hull.	58. William Learmouth.
7. Frank Xanders.	33. L. Johnson.	59. Joe Fern.
8. Patrick Crogan.	34. Edward Frye.	60. Richard Woods.
9. Larry Levar.	35. John Hoss.	61. Andrew Hanson.
10. M. Phweiser.	36. Harry Smith.	62. Louis Shoman.
11. J. Ruzick.	37. Joe Denton.	63. August Berger.
12. M. Dilo.	38. J. Stevens.	64. Walter Beamair.
13. Jack Hill.	39. J. Harp.	65. E. Williams.
14. O. Bing.	40. Chris Christensen.	66. A. G. Bourette.
15. Ed Murphy.	41. Jim Denton.	67. George Strong.
16. H. Siphers.	42. Glenn Taylor.	68. George Fease.
17. Ralph Ekhoen.	43. K. Anderson.	69. J. Harris.
18. Frank Sketchell.	44. E. Smith.	70. J. Plant.
19. Ed Dunn.	45. Unidentified.	71. Val Nicholson.
20. W. E. Norton.	46. Unidentified.	72. Larry Ryson.
21. L. Schwartz.	47. Unidentified.	73. Leslie Zellers.
22. W. H. Baker.	48. Upton B. Smith.	74. S. D. Adams.
23. Frank Masterson.	49. George W. Cameron.	75. Aaron Benton.
24. George McGurk.	50. Guecomo Viettone.	76. Louis Holmes.
25. O. Ellefson.	51. Dominick Bruno.	77. Tom Welsh.
26. F. D. Swick.	52. W. J. Elliott.	78. Ernest Elgin.

There were considerable losses of horses, horse equipment, etc., which had been hired by the Forest Service for transporting provisions and tools to the fire crews. Since no funds are available, under the appropriation act, for the settlement of obligations of this kind, it was necessary to seek relief from Congress in order to meet the just claims of the owners of the property. It was also necessary to ask for a deficiency appropriation of \$935,000 to meet the expenses incurred in fire fighting. By act of Congress appropriations totaling \$902,742.90 were made for both of these needs.

Since expenses for medical attendance and hospital care of those who were injured in fighting fires, as well as the expense involved in caring for the dead, could not lawfully be met by the Government, voluntary contributions from members of the Forest Service were offered as soon as the need for help became apparent; and this was followed by an offer of assistance by the National Red Cross Society, which made it possible to meet the immediate situation adequately. Appropriations of \$20,450 made by Congress in the deficiency act, which became law on March 4, 1911, provided for the payment of medical, hospital, and burial expenses of those injured or killed, and for reimbursement to temporary employees for loss of time due to injuries sustained while fighting fires.

CONDITIONS IN THE CALENDAR YEAR 1911.

During the last six months of the fiscal year 1910-11 fires did little damage. Except in the Black Hills in the month of June, the losses were everywhere entirely insignificant. In general, the weather conditions in the spring of 1911 were, in contrast to those of 1910, highly favorable to fire protection. Throughout the West the winter of 1911 was one of abundant precipitation, and the snows stayed on the ground well into the spring. This resulted in an unusually abundant growth of vegetation, which remained green well into the summer and provided a natural protection against the spread of fire. The

summer rainfall has been, in most National Forest regions, reasonably good, and there is every indication that when the present season closes the Forests will have suffered little harm.

That fires are doing so little damage this year is, however, not solely due to improved weather conditions. A marked advance has been made in the protective system. While it would be altogether unsafe to say that, if the Forest Service were confronted again with the conditions which arose in 1910, the disastrous fires of that year would be impossible, it is certainly true that the Service is much better prepared to keep down the losses under any ordinary conditions, and that it has made appreciable progress toward the point at which the National Forests will be, humanly speaking, safe against great losses.

An analogy has often been pointed out between protecting forests and protecting cities against fire. This analogy is worth reiterating. City property can not be made reasonably safe unless there are: First, regulations to lessen the fire risk in the form of building ordinances, rules regarding combustibles, etc.; secondly, a considerable investment in signals, fire-fighting apparatus, and quarters; and thirdly, an adequate and well-organized force of disciplined men suitably located. So forests must be guarded against causes of fire and conditions favorable to its spread, must be equipped with means for discovering, reporting, and reaching fires, and must be manned with a reliable body of firefighters, stationed at the points of greatest need.

With large parts of the National Forests (and those the most rugged and mountainous parts) unoccupied and pathless wilderness, close patrol and quick access to fires by sufficient forces of fire fighters are impossible. Yet these wilderness regions contain enormous timber supplies which, though out of reach now, the Government is holding to supply future needs. A demand for this timber will come with exhaustion of the supply in regions where cutting is now active. The Government must either allow this timber to be exposed to a high fire risk or spend considerable sums yearly in protecting land now unproductive.

The development of a thoroughly efficient system of fire protection is the work of years. It calls for heavy investments in roads, trails, bridges, telephone lines, fire lines, watch towers, and ranger quarters. It calls also, obviously, for a sufficient force of men to insure early detection of fires. But it is not enough to provide merely for the quick giving of an alarm. To concentrate quickly upon a fire an experienced and properly equipped force of fire fighters, and to keep them there until the fire is under control, means careful preparation beforehand in order to meet the emergency in the right way. It can not be done on the spur of the moment.

PROGRESS IN PROTECTION.

The fires of 1910 were invaluable as a lesson. They made clear what are the most difficult problems of fire fighting under existing conditions, and showed what might be done, even under present conditions, to better the existing organization. They also aroused a much more vigorous public sentiment against fires, one effect of which has been that when fires occur the fact is widely heralded; and a higher standard of protection is now demanded than ever before.

Congress recognized the need of better protection by increasing the Forest Service appropriation for the fiscal year 1912, so as to make available an additional \$225,000 for permanent improvement work, \$135,000 for protective work and fire fighting, and in case of extraordinary emergency an additional \$1,000,000. During the winter and spring of 1911 a large part of the attention of the National Forest force was concentrated on the study of the forest-fire problem, in order that the highest possible state of preparedness might be reached and the most effective use made both of the old appropriation and of the increased appropriation available when the new year should begin.

In the permanent improvement work the development of communications was given precedence over everything else. Further, to make the work count for as much as possible, the most careful consideration was given to the relative importance of different projects. On every Forest the first question was to decide where the roads, trails, and telephones that could be built in the summer of 1911 would be of most service. There were already in existence permanent improvement plans for each Forest, prepared with a view to coordinating the work of successive years, so that all construction might take its proper place in a general scheme. The eventual equipment of the Forest with the best possible system of communications and quarters is the final object of these plans; and the fact of their existence simplified the task of deciding how to use to best advantage the increased appropriation for permanent improvements, with special reference to immediate protection against fire, but without losing sight of what will in the long run most effectively contribute to all kinds of use. The question as to what improvements are most urgently needed for fire protection was found to require, for its best answer, the preparation of special plans, with a view to coordinating on each Forest all activities which could contribute to keeping down the fire loss.

These fire protection plans were made for a large number of Forests. In another year they will have been made for all Forests. In preparing them, the first step is to locate those parts of the Forest on which fires are most likely to break out, and also those parts which are in greatest need of protection. Thus, in certain parts the danger of fires from lightning is likely to be especially great; elsewhere railroads or lumbering operations or campers may necessitate unusual vigilance; while areas on which reproduction is abundant or where much inflammable material on the ground endangers a valuable stand should be guarded more carefully than parts of the Forest where fires will do relatively little harm. After it is known how the protection should be distributed, the second step is to plan the most effective means of locating and reporting fires. This includes such matters as the location of watchtowers and lookout points, decision as to the frequency of patrol and the lines which the patrolmen should follow, provision for giving the alarm when a fire is discovered, and similar matters.

The third step covers the means of gathering help, getting them quickly to the fire, and supplying them with tools and food on the fire line. One of the great difficulties encountered in fighting the fires of 1910 was to obtain enough capable men quickly, and to provision them after they had been sent far into the woods. In making fire-protection plans all possible sources of labor supply are carefully

studied, and an understanding is reached with settlers, lumber companies, mine operators, and others so that fit men picked beforehand are ready to respond immediately to a call for help. Similarly, it is learned from what stores and ranches provisions and tools can be obtained, and in what quantities, and also where pack horses and other means of transportation can be hired. Finally, so far as possible, all the various contingencies likely to arise are considered and courses of action marked out beforehand, to the end that the best course may be taken at once and every one whose cooperation is needed may be ready to fall into line and perform his part without confusion or loss of time.

Where possible, lookout towers have been so placed that they command a considerable common field, within which fires can be very accurately located when their bearings are reported from both lookouts. Patrolmen on their rounds are called upon to report to the supervisor from fixed points at certain hours, while ranger headquarters are always connected by telephone with the supervisor's office and parties working on improvements or reconnoissance are within as close touch as possible.

The building of lookout towers and establishing of telephone communications has as yet been hardly more than begun, for the permanent-improvement appropriation necessitates doing the work a little at a time; yet a great advance has been made, because so much care has been used to do what could be done at the points where it would give the largest results. As a supplement to the permanent telephone lines it was found that temporary lines of insulated copper wire could be laid cheaply and rapidly. Insulated wire, weighing less than 30 pounds to the mile, can be carried on a pack horse to any point from which it is desired to extend an existing line so as to establish temporary telephone connection with a field party or lookout. The insulated wire is then laid on the ground. It has been found good for any distance within 60 miles.

One of the most serious of the fire risks to which the National Forests are exposed is that created by railroads. Of the known causes of fires in 1910, 32 per cent were due to sparks from railroad locomotives. There are approximately 2,000 miles of track within the National Forests, besides logging railroads. The most careful attention has been given to devising and putting into effect measures for preventing fires along railroad lines, and for the prompt discovery and extinguishment of fires which may be started. These measures include the clearing away of inflammable material along the tracks, the cutting of fire lines, provision for patrol, the assistance of railroad employees, both in giving the alarm when fires are discovered near the railroads and in putting out the fires, and the prevention of the dropping of live coals and the throwing out of cinders. Safety against the starting of fires from the throwing out of cinders, especially on heavy grades, calls for the equipment of locomotives with efficient spark arresters or the use of oil for fuel.

There is an increasing willingness on the part of railroads to cooperate with the Forest Service in diminishing the fire risk along their lines. It is obviously to the interests of the railroads themselves to prevent fires, both because serious fires may inflict heavy losses on the railroads in the destruction of property, the interruption of traffic, and the loss of tonnage which results when timber is consumed, and

because the courts are now holding railroads liable for damages resulting from fires which the railroads cause. In a number of cases damages were paid last year by railroads on account of fires on National Forests for which they were responsible. With the principle established, as it now is, that the loss of reproduction constitutes a legitimate and tangible claim for damages, the interest of railroads in preventing fires from spreading has become much greater.

Special mention should be made of the admirable spirit in which the Chicago, Milwaukee & Puget Sound Railroad has acted to reduce the fire risk along its lines. By the use of oil-burning locomotives in the Rocky and Cascade Mountain Ranges and the careful clearing of its right of way across National Forest land, the fire risk was greatly lessened. The Great Northern and Northern Pacific Railway companies also materially reduced the danger along their lines by entering into cooperative agreements with the Forest Service. These agreements were signed in the spring of 1910. They provided for the close patrol of the railroads during the fire season, for the supplying of equipment, telephone connections, tools, and other necessities for effective work in fire fighting, and for payment by the railroads of the cost of fighting fires which start within 200 feet of the track and are not proved to have been caused by some other agency than the railroads, and also of fires at a greater distance which are proved to have been caused by the railroads.

In the spring of 1911 a further advance was made by a cooperative agreement between the Forest Service and the Northern Pacific Railway for joint protection of areas on which lands of the railway are intermingled with National Forest land. Where the railway company was granted alternate sections of land by the Government, and these alternate sections lie within National Forests, neither the company nor the Forest Service can protect its holdings effectively without cooperation from the other. The agreement is an example of the cooperative agreements which have been entered into with private owners, generally organized into associations, for keeping down the fire losses where fires on private lands would endanger the National Forests. Among these associations are the Oregon Forest Fire Association and the Washington Forest Fire Association, the holdings of which include most of the heavily timbered west slopes of the Cascade Mountains; the Pend Oreille, Coeur d'Alene, Potlatch, and Clearwater Timber Protective Associations, whose holdings embrace the greater part of the white-pine belt of northern Idaho; and various smaller organizations. These agreements provide for a division of the cost of protecting specified areas where both parties to the agreement would suffer from failure of the other to protect its lands, on the basis of the relative holdings of each. The object and the result of these agreements are, so far as the Government is concerned, better protection of the National Forests at a lessened cost to the Government.

Both the desire of associations of private owners to join forces with the Forest Service in this protective work and the spirit of cooperation shown by the railroads in efforts to reduce the fire risk illustrate the growth of public sentiment generally in favor of preventing fires. The gain in public sentiment on this point during the last year has been enormous. Incidentally, this gain has put the Forest Service to a severer test than formerly to come up to the demand of the pub-

lic for efficient work. Where fires were in the past regarded as inevitable and little attention was paid to them, immediate public attention is now focused upon them as soon as they break out, and the Forest Service is expected to bring them under control at once. This is shown in the attention which newspapers now give to forest fires—an attention which would not have been thought worth while until very recently. As a means of awakening public sentiment and creating a realization of the fire danger and the possibility of keeping it down the terrible fires of the summer of 1910 exerted an influence which it would be hard to overestimate. This increased sensitiveness of the public mind on the fire question is one of the most helpful evidences of progress. It means, of course, a diminution of carelessness, better laws, and more general efforts to combat fires everywhere. The Forest Service can well afford to have the community critical of its work for the sake of the support to the general cause of fire protection which this state of the public mind gives.

REFORESTATION.

Approximately 15,000,000 acres of National Forest lands which are capable of producing timber and valuable chiefly for that purpose have been denuded of their original tree growth. These lands are not adapted to agriculture and possess but slight value for grazing. In their present condition they are practically unproductive barrens.

It is probable that one-half of this area will reforest naturally through the reseeding of burns and the encroachment of tree growth upon natural gaps, parks, grass, and brush lands. Natural extension of the Forest on such areas is progressing at an estimated rate of 150,000 acres annually. The mere protection of this increasing acreage of young forest from fire, without other measures, will greatly increase the value of the National Forests and their future productive capacity.

The remaining half of the denuded area, 7,500,000 acres, must be reforested by artificial methods. Aside from this land, which is unquestionably adapted to growing timber and useful to the country primarily for this purpose only, there is a large aggregate area of grass lands scattered mostly in small patches throughout the Forests or above timber line, portions of which it may be found desirable and practicable to stock with trees.

Aside from the areas denuded through burns or other natural agencies, some 90,000 acres cut over annually under National Forest timber sales will reforest promptly by natural seeding through the careful selection of the trees to be cut with this end in view.

The problem in the broad is the most productive use of National Forest lands which have little or no value for other purposes, to the end that the Forests may serve most fully the objects for which they were created. It is directly related to accomplishing the largest possibilities of many Forests in their function as conservers of stable streamflow.

The duty of the Forest Service to put the denuded areas which will not be reforested naturally into a condition of productivity and usefulness is clear. Under the semiarid conditions prevailing on many National Forests this work involves uncertainties and unsolved problems. In the National Forest regions artificial reforestation was an untried field when the Forest Service entered it. It therefore had to develop its own practice in the face of a great variety of condi-

tions, largely unfavorable. The situation still calls for intensive experiments to develop the best methods, from the standpoint of both cost and results, applicable to each region. It also calls for the application on a large scale of the methods demonstrated by experiment to be successful.

Intensive experiments must come first. Business prudence requires the development of methods in detail, and reasonable certainty as to their results, before large sums are expended upon field operations. In the least favorable regions, like the semiarid portions of the Southwest, the work must be restricted for the present to small, carefully conducted experiments, the result sought being reliable information on how to proceed rather than the reforestation of many acres. In the most favorable regions, as on the west slopes of the Rocky Mountain and Cascade Ranges in the Northwest, the results already obtained justify operations upon a larger scale simultaneously with continued intensive investigations.

Broadly speaking, all of the reforestation work of the Service is experimental in character. Even in the most favorable localities further experience is needed to perfect the details of the methods now employed and, in fact, to select the general method to be used in the ultimate prosecution of the work from the standpoint of maximum return for each dollar expended. The difference in the policy followed as between favorable and unfavorable regions is primarily as to the scale of work. The better opportunities for success in the latter case justify heavier expenditures in order to make a start upon the enormous acreage of denuded land confronting us. The main volume of work upon which available funds will be chiefly spent must therefore be restricted to areas having the best soil and moisture conditions, where assurances of success are most certain. As the work is extended into each new region or Forest, following experimental results which are sufficiently conclusive, the most favorable sites available will first be chosen. After the possibilities and limitations of each method have been ascertained by experience under the best conditions in each locality, the work can be either intelligently extended or restricted.

Within the conditions outlined watersheds used for municipal supply or irrigation should continue to receive first consideration. Large sums can not, however, be spent on such watersheds under any considerable uncertainty as to the outcome; that is, before successful methods have been perfected by experiment. It will be advisable, furthermore, to conduct reforestation work simultaneously for the primary object of producing timber where climatic and other factors are particularly favorable. As far as possible such areas are being selected with reference to (1) low cost of the work, (2) natural conditions which insure rapid tree growth, and (3) urgent local need for additional supplies of forest products.

Prior to the fiscal year 1911 approximately 13,775 acres of National Forest land were reforested by various methods. This work was almost wholly of an intensive experimental character, conducted under a great variety of conditions and including typical forest areas in practically all of the Western States. Many of these experiments accomplished little so far as the actual stocking of denuded areas is concerned, but they were all of the utmost value in furnishing a basis for future work.

During the past year, in accordance with the policy of the Department, the work was materially expanded. Reforestation of large National Forest areas was entered upon, along with continued investigations. In all 25,230.51 acres were covered at a cost for seed, nursery stock, equipment, and labor of \$133,802.01. Additional expenditures for the maintenance of nurseries, the production of nursery stock to be used in subsequent years, and the collection of seed to be sown in the fall of 1911 and the spring of 1912 aggregated \$69,400.

To place the reforestation work on a thoroughly sound basis it will be essential to continue intensive experiments for many years. The latter should be supplemented, however, by the application of the most successful methods, as they are developed, to large areas where the best natural conditions are found. It will be practicable for the Service, as now organized and equipped, to reforest 30,000 acres annually. Any greater acreage should, in justice to the other responsibilities of the Service, and particularly in justice to the maintenance of efficient fire protection, be provided for by increases in the specific appropriation for this work.

The acreage reforested annually should be mainly in the four northern districts, where natural conditions are most favorable and the best results have been obtained. In districts 3 and 5, embracing Arizona, New Mexico, and California, immediate work should be restricted to intensive experiments on a small scale. Extended operations are not justified in these districts until successful methods of meeting their adverse local conditions have been perfected.

Two general methods of reforestation have been developed by the experimental work conducted in the past:

(1) Direct seeding, under which tree seed is sown upon the ground with or without simple forms of cultivation.

(2) The growing of seedlings in nurseries under ideal conditions as to soil, light, and moisture, to be transplanted into the field when of suitable size.

Direct seeding is the cheaper and more rapid method, but is necessarily limited to sites whose soil and moisture conditions are exceptionally favorable to tree growth. The inability of the freshly germinated seedling to establish itself except in comparatively moist soil makes the success of this method on the semiarid Forests, subject to prolonged dry seasons, very problematical. In such localities its use must be restricted to experiments designed to determine the exact range of conditions under which it is feasible. The main effort of the Service has been given to direct seeding on areas where reasonable success appeared to be assured.

The planting of 2 or 3 year old seedlings largely overcomes the adverse soil and moisture factors which appear to have made direct seeding unsuccessful in many localities. This method, the general practice in European forestry, must probably be employed to reforest a considerable portion of the denuded lands. The growing and planting of nursery stock is carried on simultaneously with direct seeding, but on a much smaller scale. Its object is to ascertain the comparative results of the two methods, the sites on which the greater success will be obtained from each, and the proper relation of the two methods in the future development of reforestation work. Conclusive data on the comparative cost of seeding and planting have not yet

been secured. The cost of both in last year's work, planting particularly, was high because of (1) the inclusion of a large number of small experimental areas at a high unit cost and (2) the necessity of doing a portion of the work with high-priced ranger labor after the funds specifically appropriated for reforestation had been exhausted. It is probable that the cost of the two methods, seeding and planting, under similar conditions as to labor and scale of work is in the ratio of 1 to $2\frac{1}{2}$ or 3.

The following table summarizes the seeding and planting operations of the year by States:

State or Territory.	Area seeded.	Area planted.	State or Territory.	Area seeded.	Area planted.
	<i>Acres.</i>	<i>Acres.</i>		<i>Acres.</i>	<i>Acres.</i>
Arizona.....	792.02	6.95	Nevada.....		12.01
Arkansas.....	45.52	28.88	New Mexico.....	342.94	56.57
California.....	2,659.17	169.17	North Dakota.....	159.00	28.00
Colorado.....	3,228.76	82.70	Oklahoma.....		4.00
Florida.....	169.90	2.20	Oregon.....	6,485.61	6.43
Idaho.....	624.41	328.27	South Dakota.....	2,322.60	
Kansas.....		58.54	Utah.....	64.82	511.22
Michigan.....	221.28	27.74	Washington.....	3,249.00	91.50
Minnesota.....	133.69		Wyoming.....	900.30	
Montana.....	1,831.02	521.17			
Nebraska.....	5.00	60.12	Total.....	23,235.04	1,995.47

THE DIRECT SEEDING WORK AND PROBLEMS.

Three distinct problems are confronted in the prosecution of direct seeding: Seed supply, rodent injury, and cheap cultivation.

The problem of seed supply has been met by organized seed collecting and extracting operations conducted by the Service directly, by purchases from local dealers or under special contract, and by purchases of European seed of species apparently suited to the conditions on certain Forests. During the year, 52,798.45 pounds of seed of coniferous species were collected by the Forest Service at an average cost of \$1.24 per pound, and 10,632 pounds of seed of hardwood species at an average cost of 11.6 cents per pound; while 26,734 pounds of conifer seed were purchased at an average cost of 78 cents per pound, and 28,162.5 pounds of hardwood seed at an average cost of 3.6 cents. The total amount of seed secured during the fiscal year was 118,326.95 pounds, at a cost of \$88,616.60.

The cheapest method of collection, and the one most extensively employed, is by the purchase of cones at advertised rates upon delivery at ranger stations or points of shipment to extracting plants. In favorable seed years cones of the more common western trees can usually be obtained at prices ranging from 25 to 75 cents per bushel. Where this method can not be used either because there is no one to undertake the work or because there are no funds available for the purchase of cones, seed is collected by forest officers by stripping cones directly from standing trees or from those felled in logging operations, or by gathering from the vast stores assembled by squirrels.

Seed extraction can usually be done most economically by experienced forest officers. It requires drying by exposure to natural or artificial heat, to open the cones; threshing, to separate the seed from the scales and woody portions of the cone; and cleaning or fanning, to remove chaff and dirt. Much of the extraction has hitherto been

done in small quantities, at a large number of stations, with very simple appliances. In view of the amount of seed which must be handled each year, the cost of extraction can be materially reduced and seed of higher average fertility obtained by concentrating the major part of this work at central plants equipped with improved machinery. Three extracting plants of this character are in process of construction, on the Oregon National Forest, in Oregon, the Medicine Bow National Forest, in Wyoming, and the Harney National Forest, in South Dakota.

The seed collected by the Forest Service shows a wide variation in cost. This is due primarily to great differences in the seed crops from year to year. The cost of yellow pine seed collected in Montana has ranged from 61 cents per pound in favorable years to \$2.01 in seasons of deficient seed crops, and the cost of Douglas fir seed from 84 cents to \$2.58. Since direct seeding, particularly under the broadcast method, requires relatively large quantities of seed, the initial cost of the seed bears a very important relation to the total cost per acre of the completed work.

A problem of still greater importance from the standpoint of final results is that of having seed available at the season of the year when needed for most effective use. Past experiments have demonstrated that fall sowing is essential to success in most of the localities where extensive seeding projects will be conducted. Experience has also shown that seed on a large scale can not be extracted in time for use the same season.

The purchase of clean seed from local collectors is often advisable in localities where this industry has been developed and the quality of the seed is assured. Such purchases must usually be made, however, at prices above the cost involved when cones can be obtained by contract or hired labor. Nor do such purchases meet either the problem of excessive cost in seasons of short crops or that of inability to secure the seed from year to year at the right time for successful sowing.

European seed is exceptionally cheap. It does not vary greatly in cost and can usually be obtained in the quantities and at the seasons desired. In order to sow the acreage desired last year the collection of native seed was supplemented by extensive purchases of Scotch and Austrian pine at 43 cents per pound, Norway spruce at 32 cents, and European larch at 76 cents. The low average cost of the seed purchased as compared with that collected is due primarily to the inclusion of these foreign orders.

The results obtained in a large majority of the experiments conducted up to the present, however, do not warrant further extensive purchases of European seed. The adaptability of these foreign species to soil and climatic conditions in the western United States is too questionable to justify their further use on a large scale until success with them is assured by conclusive experiments. In the present stage of this work it will be far preferable to rely mainly upon the valuable native trees produced naturally under the very conditions with which we are dealing, and to limit the use of exotics to small experiments designed to show how far they may wisely be employed.

Experience has demonstrated also that the quality of purchased seed, both domestic and foreign, is much less dependable and subject to control than that of seed collected by the Forest Service. This

affects both the percentage of fertile seed and the time required for germination, two factors vital to success.

The problem of seed supply can be most effectively met by concentrating upon collection of local purchases in years when seed crops are abundant and the cost therefore relatively low. The practicability of storing seed for at least one year, with slight loss in fertility, has been demonstrated. In seasons of abundant crops it will be advisable to collect two or even more years' supply of seed. In such seasons it may be necessary to concentrate the efforts and funds of the Service primarily upon this feature of the work, with a proportionate reduction in the acreage sown. Extensive collection should not be attempted in years when the cost of seed will, on account of poor crops, be excessive or when seed of the species required for the more favorable sites can not be obtained. In such seasons the organization and funds will be concentrated mainly upon sowing in so far as it is found practicable to carry reserve supplies of seed ahead. This method will maintain the balance of the various parts of the work and accomplish the reforestation of the areas desired by periods of years. The reduced cost of seed and its availability at the right time for sowing should materially increase the area which it is possible to reforest successfully with given funds.

Seed tests were continued during the year as an essential factor in the solution of the general problem of seed supply. The tests covered (1) the fertility of over 150 samples of seed collected on the National Forests, (2) the relative merits of various containers of seed, and (3) the results of various methods of storing seed. Tests of different methods of germination were discontinued, all germination tests being conducted by the soil method.

The tests of fertility of samples of collected seed were used directly in determining the amount of seed to be used in both field sowing and nursery operations. The storage tests showed the sealed glass jar to be the best container, and that seed must be stored either in air-tight receptacles or at low temperatures to be kept for any considerable period without loss of fertility.

The destruction of sown seed by rodents has been one of the greatest obstacles encountered in reforestation. The failure of many of the earlier seeding projects was due primarily to loss from this cause. It has occurred on areas of practically every character, regardless of the time of year when the seed was sown, except in cases where recent burns had largely eliminated the animals either by outright destruction or by loss of food supply. Special effort has been given to the solution of this problem during the last year, with the efficient assistance of the Biological Survey, and a large number of methods of destroying destructive species were tested in the field. The coating of seed with poisonous substances has not proved effective. On many areas, however, free use of poisoned grain has reduced the loss from rodents sufficiently to secure satisfactory germination. The successful elimination of such injury appears to lie in the thorough poisoning by this method of areas to be seeded, once or oftener in advance of sowing.

With successful germination assured, the great problem lies in cheap methods of cultivation and sowing, which will enable the young seedling to develop its root system early enough and rapidly enough to withstand the first annual drought, the dominant climatic feature

of all of the western National Forests. During the year over 700 separate tests were made, on 114 National Forests. Twenty-four native conifers, 12 native hardwoods, and 12 foreign species were tried. Seed was sown at the beginning of midsummer rains in the Southwest, in the fall, in midwinter, and at various periods in the spring up to June 1.

Three general methods were employed:

(1) Broadcast sowing in the fall and spring and upon snow in winter, both on unprepared ground and on soil which had been scarified by rough brush drags, harrowing, disking, and partial or complete plowing.

(2) Seed-spot sowing, in which the seed is planted at regular intervals in small spots where the soil is cleared of vegetation and worked loose to a depth of 5 or 6 inches.

(3) Corn planting, or dibbling, in which the seed is thrust into the soil by a hand corn planter, or, in the case of large nuts, pressed into holes made with pointed sticks. This method was combined on a number of areas with the preparation of seed spots or the plowing of single furrows in order to plant the seed in loose soil free from vegetation.

On a large majority of the Forests broadcast seeding on unprepared ground has not succeeded. As a rule, satisfactory stands have been secured from broadcasting only after an expenditure for preliminary cultivation which would be impracticable in extended operations and which exceeds the cost of planting with nursery stock. Seeding in spots or by corn planters, or by a combination of these methods, has in the main proved far more successful. This method is also most economical, since it requires a minimum amount of seed—approximately one-fourth of that used in broadcasting. Winter and spring seeding has brought poorer results as a rule than fall seeding. Fall-sown seed germinates from four to six weeks earlier than that sown in the spring, and with many species germination is far more uniform and complete. These factors are of vital importance in carrying a satisfactory stand of seedlings through the first dry season, the most critical period of their entire life.

Fall seeding, with the spot method of cultivation, is the general method of future work indicated by the experience of the past year. Another essential feature of future work, forcibly demonstrated by the results of the past year, is concentration of seeding upon comparatively few Forests in the four northern districts. Large areas where the most favorable soil and moisture conditions exist will be carefully selected, mapped, and studied in detail with reference to all factors affecting success. Such areas will be systematically poisoned and protective measures against grazing and other possible injury taken if necessary. Seeding operations will be concentrated upon these areas, year after year, until the entire tract is successfully reforested. Through such concentrated operations on a large scale the best expert supervision can be given at minimum cost per acre, while results obtained under different methods and seasonal conditions and with different species can be closely compared.

The largest areas were seeded in the main commercial timber belts of the central West, Northwest, and Pacific slope: 2,578.38 acres with Austrian and yellow pine in the National Forests of the western Dakotas and eastern Montana; 5,972.95 acres with yellow pine,

Engelmann spruce, Douglas fir, and lodgepole pine in the central and northern Rocky Mountain Forests; 8,062.47 acres with Douglas fir, Sitka spruce, yellow pine, hardwoods, and various European species in western Washington and Oregon; and 1,883.48 acres with sugar, yellow, and Jeffrey pine, incense cedar, and Douglas fir in the Sierra Nevada Mountains and northern ranges of California. Successful reforestation was accomplished on some areas in every locality, usually those where thorough poisoning has been combined with fall sowing in seed spots or with other simple methods of cultivation. It is probable that a satisfactory stand of young trees will be secured on at least a third of the entire acreage sown. The results as a whole indicate that reasonable success may be anticipated with native species under the policy of concentration upon the most favorable sites, with the work restricted mainly to fall sowing in prepared soil.

Small experiments in seeding with Norway pine the sandy barrens composing the National Forests of Michigan were begun. The development of successful methods on these Forests will be of exceptional value because of the enormous area of waste lands in northern Michigan to which they can be applied. Another promising line of experiments which has been successful is the extension of the valuable hardwoods of the Southeast by seeding on the National Forests of Arkansas. On the Ozark Forest 38.15 acres were sown with black walnut, hickory, and white and red oak, and 5.26 acres with black locust. This work will be materially increased during the ensuing year.

The introduction of valuable exotics on portions of the Florida National Forest, on inferior soils where natural reproduction is scattered or wanting, has formed another set of experiments which may have results of great economic importance. Three acres were sown with the cork oak of the Mediterranean, and 157 acres with maritime pine, the tree which supports the naval-stores industry of France. These experiments will be continued until conclusive results are obtained.

The average cost of the areas seeded, including seed, was \$4.08 per acre. The cost in the respective districts varied from \$2.35 per acre to \$6.95, the chief factors being (1) cost of seed and (2) the size of the areas seeded. The cheapest work was done in the large projects of western Oregon, where solid blocks of several hundred acres each were sown by organized crews of temporary laborers. Under the policy adopted of concentrated seeding on large areas and the collection of large amounts of seed in years of favorable crops, it is probable that future seeding can be done uniformly at a cost of \$3.50 to \$4 per acre.

PLANTING AND NURSERY WORK.

With the major emphasis directed to seeding, it is the policy of the Service to continue the production and planting of nursery stock upon a limited scale; to develop its nursery practice to the highest efficiency; to secure a series of comparative tests of planted stock with direct seeding; and to extend experimental plantations into the less favorable sites until the limitations upon this method are determined. Its nursery and planting operations will be gradually extended, as may be necessary for these purposes or to secure greater

economy in the production of seedlings, but not so as materially to increase the cost of this part of the work.

The experimental character of the nursery work and the fact that much of it is done under the administrative appropriations for the respective Forests has required the establishment of a relatively large number of nurseries, mostly of small capacity and maintained by rangers in connection with other duties. The following is a complete list, with the annual capacity of each nursery as developed up to the present and the estimated stock of all ages on hand at the end of the fiscal year:

Nursery.	Forest.	Annual capacity.	Present stock.	
			Seedlings.	Transplants.
Boulder.....	Helena.....	3,000,000	6,427,300	1,231,300
Savenac.....	Loio.....	1,500,000	3,721,400	278,800
St. Regis.....	do.....	(1)	104,517	.....
Trapper Creek.....	Bitterroot.....	50,000	291,000	38,000
Dakota.....	Dakota.....	200,000	145,000	.....
Cass Lake.....	Minnesota.....	100,000	225,000	.....
Monument.....	Pike.....	700,000	1,257,000	602,800
Halsey.....	Nebraska.....	2,000,000	2,215,410	378,290
Garden City.....	Kansas.....	300,000	318,200	20,410
Animas.....	San Juan.....	10,000	20,270	.....
Hyannis.....	Nebraska.....	10,000	.....	5,930
Fort Bayard.....	Gila.....	150,000	196,300	51,000
Gallinas.....	Pecos.....	100,000	183,400	82,000
Frye Canyon.....	Crook.....	40,000	130,400	.....
Coconino Experiment Station.....	Coconino.....	10,000	41,000	14,000
Rocky Bayou.....	Choctawhatchee.....	2,500	2,500	.....
Uinta.....	.....	4,000,000	4,306,000	2,100
Wasatch.....	Wasatch.....	5,000,000	5,285,000	634,500
Pocatello.....	Pocatello.....	3,000,000	3,285,000	33,300
Cottonwood.....	Boise.....	50,000	100,000	.....
Long Gulch.....	do.....	100,000	102,400	.....
Pine.....	do.....	50,000	16,000	.....
Flowers.....	Sawtooth.....	100,000	130,000	.....
Upper Jose.....	Manti.....	50,000	65,000	13,700
Poorman.....	Payette.....	10,000	15,000	.....
Pilgrim Creek.....	Shasta.....	500,000	388,000	54,900
Converse Flats.....	Angeles.....	200,000	159,000	27,000
Los Prietos.....	Santa Barbara.....	(1)	8,300	49,000
Wind River.....	Columbia.....	1,000,000	591,000	1,075,700
Silverton.....	Snoqualmie.....	500,000	410,000	5,500
Page Creek.....	Siskiyou.....	50,000	44,200	45,118
Total.....	.....	22,702,500	30,208,597	4,643,348

¹ To be discontinued.

Since two years is the minimum age at which nursery-grown seedlings can ordinarily be planted in the field, the stock now on hand, aggregating 34,851,945 plants, represents about three-fourths of the capacity of the present nurseries. The enlargement of the Halsey nursery, Nebraska, to a capacity of 2,000,000 plants seemed advisable in order (1) to secure a greater return from the investment in nursery equipment and from the services of the experts employed at the station, without increasing the running expenses; (2) to begin the production of Norway pine stock, a species which appears peculiarly adapted to the western Nebraska sandhills; and (3) to provide for the distribution of seedlings to settlers in accordance with the act of March 4, 1911, known as the Kinkaid Act. The latter is a significant step in Federal policy. The distribution of free stock to homesteaders in small quantities will begin in the spring of 1912, when approximately 50,000 plants will be available. The annual produc-

tion of seedlings for this purpose will be gradually increased up to half or three-fourths of a million, as the demand warrants. The plantations established with this stock will be systematically inspected to insure proper methods in planting the trees and the restriction of their distribution to settlers who make effective use of the seedlings.

The Dakota National Forest was created in response to the request of many citizens of North Dakota, primarily as a demonstration station in methods of reforestation. The establishment of a small nursery seemed necessary to accomplish this purpose. On many portions of the Dakota natural conditions are so adverse that the use of nursery stock will undoubtedly be required for successful reforestation. Yellow pine and native hardwoods, particularly elm, box elder, and green ash, will be the species used.

The Los Prietos nursery on the Santa Barbara and three nurseries in the foothills of the Angeles will be discontinued with the planting or transfer of all remaining stock. Natural conditions in the foothill belt of southern California, a belt naturally treeless and exposed to an exceptionally long season of drought combined with high temperature, are so difficult to overcome that it has seemed wise to cease further attempts at afforestation. This decision was based upon the negative results of a large number of plantations made during the past seven years, and upon the conviction that the stream-conserving function of these watersheds will be better met by their native cover of chaparral than by any growth of trees which it is possible to establish. Reforestation work in southern California has therefore been transferred to the timber belt, above 5,000 feet, where success is far more assured and where the planting of large areas will be exceedingly desirable, both for the further protection of headwaters of irrigation systems and for the production of commercial timber. In accordance with this policy the Converse Flats nursery has been established on the Angeles National Forest at an elevation of 5,500 feet. This nursery will be kept on a small, intensive basis, its function being to conduct experimental tests of a wide range of methods.

An advance in the development of methods adapted to semiarid conditions was made by tests at the California nurseries and the Coconino Experiment Station of transplanting young seedlings to individual pots of pasteboard or tarred paper, and of growing them in pots from the start. When ready for the field, the entire pot is set out without disturbing the root system of the young plant. This method has been extensively used in India and South Africa, and promises greater success in carrying seedlings through the first dry season than is possible under the loose-root or European system.

In general nursery practice the chief efforts of the Service during the year have been directed to (1) reducing the cost of growing stock, and (2) continuing exhaustive experiments to determine the best nursery rotation for each of the principal species. The cost of the stock previously grown by the Service has been excessive on account of the relatively small size of the nurseries, the heavy initial investments required for equipment, and losses in the first-year seed beds and in transplanting. These elements of cost have been materially reduced through the completion of the equipment of the nurseries, improved organization in the matter of scale of production and proportionate overhead expenses, and study of the causes of loss in the seedlings and means of preventing it. Much has been accom-

plished to eliminate injury from "damping off" fungi in the first-year seed beds and to perfect methods of transplanting which reduce the loss from that process.

Substantial progress has been made in reducing the cost of nursery-grown stock. Two-year-old yellow pine seedlings were grown at the Montana nurseries at costs ranging from \$1.44 to \$2.46 per thousand plants, and 2-year-old Douglas fir seedlings at a cost of \$2.22 per thousand. One-year seedlings were grown at the Wind River nursery, Washington, at a cost of 37½ cents per thousand, exclusive of the cost of nursery improvements and equipment. This stock can be carried a second year in transplant beds at a total cost when ready for the field of \$1.75 per thousand plants. With the present organization of the Utah and Idaho nurseries it seems probable that 2-year-old seedlings can soon be produced at 75 cents per thousand plants, and 2-year stock once transplanted at \$1.75 per thousand. A large portion of the stock planted during the year cost from \$8 to \$12 per thousand seedlings, this item being the principal factor in the high average cost of the plantations established. The foregoing figures, however, indicate the possibilities of greatly reducing this cost through experience and better organization of the nursery work.

For the greater part of the planting now being done by the Service a nursery rotation of two years, one year in seed beds and one year in transplant beds, produces stock of adequate root and crown development. One transplanting during this period is ordinarily necessary to harden the root system and promote the growth of lateral roots. With some species, particularly the hardier pines, it seems probable that the cost of transplanting in the nursery can be eliminated by using 2-year-old seedlings in planting on favorable sites. In fact, some tests with yearling seedlings of yellow pine on good soil have been successful, owing to the very rapid root development of this species in the early stages of its growth.

With this possible exception, experience has eliminated the use of stock under 2 years old in planting with the loose-root system. In potting transplants for arid districts it may prove practicable, under the protection thus afforded the young roots, to use stock but 1 year old by transferring the seedlings to pots within a few weeks of germination. For the less favorable localities, as in portions of the Southwest, tests with older stock will be continued until comparative results are reached which are conclusive. These will include 3 and even 4 year old stock twice transplanted in the nurseries in some instances in order to form hardier and brushier root systems.

The greater part of the areas planted were in the central and northern Rocky Mountains, using the native species—yellow pine, Douglas fir, Engelmann spruce, and lodgepole pine. Tests with Scotch and Austrian pine, two exotics of great drought-resisting power, were continued, together with small experiments with valuable eastern hardwoods.

The work in California included 77.87 acres of eucalyptus and hardwoods. The susceptibility of eucalyptus to frost and its exacting soil requirements apparently restrict the acreage of National Forest land to which it is adapted to a very small amount. The importance of the eucalyptus to California, however, makes it desirable for the Service to continue experimental tests with a view to building up our knowledge of the silviculture of the various species, very few of

which have been thoroughly tested in North America. The plantations of the two preceding years have proved successful on the relatively good soils and with intensive cultivation. The main emphasis is now being given to pit planting on the rougher ground where cultivation is not practicable. Experiments were conducted during the last year with 14 species on the Angeles and Santa Barbara Forests, and will be continued during the coming year on the same scale. Small eucalyptus experiments were also begun on the Florida National Forest.

The experimental planting of maritime pine on sand dunes along the Pacific Ocean in the Siuslaw National Forest, Oreg., was inaugurated. Aside from the utilization of waste land it is important to determine the possibilities of establishing forest cover on such areas as a means of controlling shifting sand, which is a serious menace to many Pacific coast harbors.

Up to the present time the results on a large majority of the plantations are satisfactory, with upward of 60 per cent of the plants in a thrifty condition. On a large number of tracts over 90 per cent of the seedlings have survived the first dry season and made satisfactory growth. With the experience acquired it seems practicable to obtain uniformly a stand of at least 80 per cent by this method on all but the distinctly unfavorable sites.

The cost of planting varied greatly with the size of the areas planted, the cost of the stock, and the more or less intensive character of the work. Small tracts were planted with jack pine in Kansas and with white pine in Arkansas at a total cost of \$4.75 and \$5 per acre, respectively. Sixty acres were planted with Sitka spruce, yellow pine, and white pine in the Snoqualmie Forest, Wash., at a total cost of \$6.72 per acre. The average cost of this year's planting was \$19.56 per acre. The unit cost of this work must necessarily remain high as long as it is conducted on a small scale, and largely with a view to obtaining better knowledge through experiments rather than primarily for the sake of the improvement of the specific area planted. The cost will be materially decreased, however, as reductions are made in the cost of growing nursery stock. On a reasonable scale of operations it should be feasible for the Service to do much of its planting at a cost of \$8 per acre, and to bring the average below \$12 per acre.

FOREST INVESTIGATIONS.

Both experimental and general studies were conducted to obtain a better scientific basis for National Forest management. These studies also develop the knowledge needed for the practice of forestry generally on western timberlands.

Experimental studies of an intensive character were conducted almost exclusively at the Fremont, Wagon Wheel Gap, and Fort Valley Experiment Stations. Because of the importance of the reforestation work of the Service, the experiments were directed chiefly to this problem. Aside from tests of a wide range of methods in seed extraction, direct seeding, nursery work, and field planting, studies in tree breeding and the factors governing production and fertility of tree seed have been inaugurated. These cover the effects of altitude, precipitation, and soil upon seed, and the adaptability of seed to different conditions from those under which it was pro-

duced. The classes of trees which produce the most vigorous seedlings and the transmission of defects in seed-bearing trees to the seedlings form a second group of valuable studies. Tentative results obtained at the Coconino Experiment Station indicate that yellow-pine trees under 250 years of age produce seed of 8 per cent higher fertility than that from trees of a greater age; and that trees affected by mistletoe or infested with bark beetles produce seed of a much lower germination per cent than healthy trees. Records have been established at this station of about 100 trees in various stages of decadence to determine how long they will continue to bear seed.

Studies in natural reforestation have been begun on a number of National Forests, the primary object being to determine methods of cutting and brush disposal in timber sales which will secure the best reproduction of desirable species. These experiments include Douglas-fir stands in the Cascade Mountains, lodgepole-pine and Engelmann-spruce stands in the Rocky Mountains, and yellow-pine stands in Arizona. On the Coconino Forest, experiments begun in 1908 to determine the effect of scattering brush upon reproduction indicate that while brush protects young seedlings against drought and frost it is not sufficient to carry them through protracted periods of rigorous climatic conditions. The presence of scattered brush was found detrimental in keeping seeds from reaching the mineral soil and shading the young plants excessively at certain periods.

Observations on the effects of different methods of brush disposal on the Minidoka, Sawtooth, Cache, and Targhee Forests, in both old and recent cuttings, indicate that lopping and scattering will apply to nearly all types in Utah, Nevada, and northern Arizona. This method increases the fire danger and will not be advisable near settlements and lines of travel.

Studies of the effects of grazing upon natural reproduction were conducted in Arizona, with a view to devising a system of range control which would minimize such injury without requiring the total exclusion of stock from the range. Serious damage was found to have occurred to seedlings under 4 feet in height, during the dry season, on areas containing poor forage, or which had been overgrazed, or where there is little or no underbrush. It was found that sheep do twice as much damage as cattle. The revegetation of overgrazed areas, reductions in the amount of stock in some cases, provisions for better distribution of stock by regulation of watering places, and the exclusion of sheep from cut-over areas on which reproduction is deficient until the seedlings reach a sufficient height are among the measures to be tested for lessening this injury.

Experiments were also conducted to determine the practicability of opening dense stands of chaparral in northern California by regulated goat grazing, in order to make possible the extension of forest growth into the enormous brush fields of that locality. Definite results have not yet been reached.

Aside from investigations related to reforestation, the work of the year included experimental studies of forest influences, the climatic requirements of forest types, growth and yield studies, sample plot studies, and insect and fungus investigations.

That the forest exercises a decided moderating influence upon temperature extremes, wind motion, and evaporation was shown by experimental observations which have been conducted at the Fort

Valley Experiment Station since January 1, 1908. These conclusions, which are based upon a comparison of records in a large open park and within a virgin forest, may be used to good advantage in selecting the most favorable sites for reforestation.

One of the conclusions drawn from the observations is that the presence of a forest cover retards the melting of snow in the spring. Both this question and the influence of the forest upon the accumulation of snow will be studied further through a special investigation in the yellow-pine type of Arizona and the Douglas-fir and Engelmann-spruce types of Colorado.

At the Wagon Wheel Gap Station records of great interest are being obtained from the principal experiment, which is to determine the effects of forest upon streamflow. The entire purpose of the study during the first two or three years is to determine the character of the two streams which are to be measured. The forest cover on the two watersheds is practically the same. The results so far obtained indicate that the influence upon streamflow must be about the same in both cases, and, consequently, a comparison of these streams after the denudation of one watershed will be a very fair test of the influence of the forest cover upon the relative height of the flood stage and low-water stage, the amount of erosion, and the rate of melting of the snow.

In August, 1909, the town of Ephraim, on the Manti Forest, Utah, experienced a disastrous flood from Ephraim Canyon, which was attributed in part to the overgrazed conditions on the watershed. An examination made in the spring of 1910 clearly demonstrated that the severity of the flood was a direct result of deterioration of forest, brush, and grass cover due to prolonged overgrazing. The canyon was therefore closed to grazing as an immediate protective measure, and it is planned to restore the forest cover on Ephraim Canyon by sowing and planting.

The climatic requirements of forest types has been studied at the Fremont Experiment Station since January 1, 1910, through experimental observations. The first step is to obtain a complete meteorological record as a basis for determining what climatic conditions are most important in limiting the natural range of the yellow pine, Douglas fir, and Engelmann spruce. The first year's study shows that soil moisture and soil temperature are the controlling factors in determining the existence of the three different types, and gives knowledge as to what climatic conditions each of the three species must have in order to succeed.

Reliable growth and yield data for different species and types are necessary to properly handle timber sales as well as for forest management. They are also essential for determining damages caused by fires, trespass, etc. During the year there were secured a large number of volume tables on the Custer and volume and yield tables on the Deerlodge and Kaniksu Forests for lodgepole pine, western yellow pine, and Douglas fir. Considerable progress has been made on growth studies for yellow pine, sugar pine, and incense cedar on the Stanislaus National Forest.

Sample plots have been established on a number of large timber-sale areas in important forest types. On each plot of 6 or more acres every tree is carefully measured and recorded. Similar measure-

ments will be made at regular intervals to determine the increase in volume and the production of wood, following the cutting, among the trees left of each age and species. Close observations of the reproduction which takes place, brush and other forms of cover which may establish itself, and changes in soil conditions will be recorded. The studies will help to determine the cutting methods which will bring the best results in new forest growth and maximum production of wood.

In cooperation with the Bureaus of Plant Industry and Entomology studies have been conducted on a number of Forests in tree diseases and insect infestations and methods of controlling them. Special effort was made to combat the most serious recent insect infestation, of *Dendroctonus monticola*, in yellow and lodgepole pine timber on the Whitman National Forest, Oreg. Nearly \$25,000 was expended on this Forest in cutting, piling, and burning recently infested trees. It is hoped that this work, together with logging under pending timber sales on this Forest, will at least materially check the damage threatened by this attack.

In connection with studies of the more serious fungi attacking white fir in the western Sierra Forests of California it has been found practicable in recent timber-sale contracts to require the removal of all infested trees of this species. In this manner it will be possible greatly to reduce the extent of the disease and to protect the new growth of timber from its attack.

Besides these experimental studies there were completed commercial tree studies of western yellow pine in the Southwest, Douglas fir in the Northwest, Utah one-seeded juniper, and Rocky Mountain juniper. Similar studies of western yellow pine in Oregon, western red cedar, western white pine, and lodgepole pine were begun.

RANGE MANAGEMENT.

The abnormal weather conditions which prevailed during the summer and fall of 1910 brought out strongly the practical value of the methods of range control used on the National Forests. Arrested growth and early maturity of forage, scarcity of water, and all the other disastrous effects of a prolonged drought were apparent on the Forest ranges, but their condition was immeasurably superior to that of contiguous ranges not under regulation. Despite the adverse season few losses of live stock occurred. The control of stock upon the ranges, the enforcement of Federal and State quarantine regulations, the destruction of predaceous animals with consequent lessening of stock losses, the restoration of depleted ranges, the utilization of new ranges made possible by the construction of trails and the development of new sources of water supply, all progress uninterruptedly, and, contributing materially to the amelioration of discouraging conditions, strengthened the realization of an identity of interests between the stockmen and the Forest Service to the end that the range resource may yield the largest benefit possible without sacrifice of other interests. There has been a pronounced gain in good will, approval, and cooperation everywhere.

GRAZING CAPACITY OF NATIONAL FORESTS.

Of the 150 National Forests within the United States, exclusive of Alaska, on June 30, 1911, 144 were under grazing administration. On the Santa Rosa National Forest, which was created after the beginning of the grazing season, grazing was allowed free of charge and without permit for the remainder of the 1911 season. The five other Forests are either inaccessible or lacking in forage growths, and are therefore not occupied by domestic animals.

The area under grazing administration at the close of the year was less by 2,300,000 acres than at the close of the preceding year. This represents a reduction of 1.39 per cent in area, but in grazing capacity this percentage would be largely exceeded, as the lands eliminated were chiefly lowlands of high grazing capacity and heavily stocked, principally with cattle and horses. To this fact is largely due the decrease in the amount of revenue derived from grazing privileges.

Energetic efforts on the part of the district officers in districts 1 and 6 to promote a full utilization of the surplus forage on the Forests of northern Idaho, Montana, and Washington were only partially successful, and enormous quantities of feed went to waste, adding greatly to the fire danger. More or less inaccessible and remote from spring, fall, and winter ranges and railroad shipping points, these ranges can at present be utilized by sheep only, and flockmasters, discouraged by the depression in market prices, did not care to avail themselves of the inducements offered by the Forest Service or the concessions granted by the railroads in the form of reduced feed-in-transit rates.

The effort to stock these ranges will not be relaxed, and it is anticipated that eventually the surplus forage will be fully utilized. While the demand for sheep range in some localities in district 5 is greater than the supply, in general the National Forest ranges in that district are not stocked to their full capacity. Some inaccessible ranges on the northern Forests will be used as soon as transportation becomes easier or the live-stock market improves. With these exceptions the National Forests were stocked during the first half of the year to approximately their full normal grazing capacity, and it was necessary to deny many applications for grazing privileges.

During the last half of the year, the beginning of the grazing season of 1911, an entirely different condition existed upon all but a few of the most heavily stocked Forests. For a variety of reasons wool-growers regarded the prospects immediately ahead as unfavorable, and heavy shipments to market took place during the fall of 1910. Everything for sale in the cattle line had been bought up during the fall by buyers anxious to fill contracts, and cattle not sold were held at prohibitive prices. In consequence, the numbers of stock held in feed lots and on winter range were far below normal; and this, in turn, resulted in a great reduction in the numbers of stock to be grazed within the National Forests. With an unusually abundant growth of forage available, a surplus of feed upon many Forests hitherto fully stocked or even overstocked was certain.

During the season of 1911 reductions in numbers of stock as measures of Forest or watershed protection were required on only seven Forests. The reductions made were: On the Manti, 2,000 head

of cattle and horses, 27,000 head of sheep; on the Caribou, 7,000 head of cattle and horses, 50,000 head of sheep; on the Cache, 10,000 head of sheep; on the Hayden, 12,500 head of sheep; on the Lincoln, 12,400 head of sheep and goats; on the La Sal, 4,100 head of sheep; and on the Wenatchee, 1,500 cattle and horses and 25,000 sheep. On the Manti the stock were allowed by special agreement to remain upon the Forest until the close of the season. The Caribou reduction, while partially attributable to eliminations, was mainly to promote the natural reforestation of burned-over areas; the actual reductions made in the permits of old users amounted to but a few hundred head of cattle and horses and approximately 20,000 head of sheep. The reductions in the Wenatchee were due to the passing to private ownership and utilization of large areas of land previously occupied by stock grazed under permit. The other reductions were wholly to prevent overgrazing. On the other hand, there were numerous increases in the numbers of stock authorized to graze upon other Forests, these increases in the aggregate exceeding the reductions above specified to such an extent that the total allowances for the year were greater than those for the year preceding. The collective grazing capacity of the National Forests has increased, and the reduced numbers of stock covered by permit this year are due wholly to the specific reductions mentioned above, to eliminations from the Forests, and to voluntary reductions by permittees in the numbers of stock placed upon the Forests.

There are a few Forests upon which the full reduction necessary to bring about recuperation of the range has not yet been made because such action would have caused serious disturbance of local grazing conditions. Except for these few unusual cases it is believed that the National Forest range has been brought to the point at which further reductions to stop damage from overgrazing are not likely to be called for.

RANGE CONDITIONS.

Probably at no time since the creation of the National Forests has the range been put to as severe a test as during the season of 1910. Within the National Forests the forage crop was estimated to be from 25 to 33 per cent below normal, and even upon the higher ranges it matured shortly after July 1. The range was taxed to its utmost to carry the number of stock authorized. In some sections light rains fell early in September, but these afforded only local and temporary relief. On some Forests it became necessary to remove the stock before the permit periods expired, but on others room was found for outside stock which had to be removed from the open range. In the majority of cases readjustment of ranges by the local forest officers made it possible for the permittees to obtain feed through the season. Upon only two groups of Forests were the actual losses from drought serious enough to merit special attention.

After the 1st of August the bulk of the stock sold had to be marketed as feeders, but while it was not in the best of flesh and finish as compared to preceding years, conditions generally were better than the stock growers had anticipated. Cattle from Forest ranges brought very good prices because of a strong market. The market for sheep, however, was not so strong as in preceding years, and a big drop in

values became noticeable about October. Sheep owners were anticipating another severe winter season; the drought had greatly reduced the supplies of feed on the winter ranges; the surplus stocks of hay had been exhausted during the previous winter; the season's hay crop was being held for higher prices; and the outlook was not an encouraging one. In consequence many transfers of sheep were made at prices far below those of preceding years.

The winter of 1910-11 was in most localities a very favorable one, and all classes of stock wintered well except in southern Oregon, where heavy losses were sustained because of a shortage of feed upon the desert ranges and unfavorable weather conditions. The spring of 1911 opened early in districts 2 and 3, and late in the remaining districts. Where it was early the foothill ranges showed some signs of drying out, but timely spring and summer rains have put all of the Forest ranges in excellent condition. Where the spring was late some of the sheepmen were unable to use their customary lambing grounds and were somewhat inconvenienced because of this fact, but no serious losses resulted. The range conditions at the close of the fiscal year were generally the best since the ranges came under the control of the Forest Service. The results of the effort expended in past years to secure a proper distribution of stock, to open up new grazing lands, to provide new sources of water supply, and in every way to increase both the production and the utilization of forage are now becoming manifest. In the grazing seasons of 1909 and 1910 the weather conditions were so adverse as to obscure the gain achieved. It is now plain, however, that range regulation is actually giving the stock growers more and better feed for their stock as well as security in the use of the range and consequent stability to their industry.

IMPORTANT CHANGES IN LIVE-STOCK INDUSTRY.

Prior to the year 1911 an annually increasing number of stock growers requested the privilege of substituting sheep for cattle upon the National Forest ranges, but this year there has been a noticeable reaction in favor of cattle, in all but the most northern States. Many Forest users who stocked their ranges with sheep instead of cattle a few years ago now desire to engage in cattle raising. This is wholly attributable to the fact that low prices for wool and mutton products, combined with the occupation by new settlers of many choice lambing grounds and winter ranges, have robbed the sheep industry of many of the attractions which it formerly held for small operators, while a strong demand at exceptionally good prices for all classes of cattle has made that industry more profitable than it has been for many years. The demand for sheep grazing privileges necessitated the opening to that kind of stock of many ranges better suited to the grazing of cattle, and the change which is apparently taking place will prove beneficial to the extent that it will result in the restocking of this class of range with the kind of stock best adapted to it. In the Northwestern States the tendency is still from cattle growing to sheep growing.

GRAZING TRESPASS.

The legality of the regulations promulgated by the Secretary of Agriculture for the control of the National Forests was definitely and conclusively established by two decisions rendered by the Supreme Court of the United States on May 1, 1911, and the uncertainty and unrest caused by the widespread impression that the regulations were not enforceable ceased immediately. Before these decisions were given out there was a frequent tendency to graze stock on the Forests without permit, which in some Forests took the definite form of willful trespass. The most noteworthy instance was that of the Alamo National Forest in New Mexico, where 33 cases of grazing trespass were reported during the fiscal year. Criminal prosecutions were deferred pending the decision of the Supreme Court, but favorable action was secured in many suits for injunction or for the collection of civil damages. In the future, cases of willful grazing trespass are likely to be infrequent and exceptional; when they occur, no question of the legality of the regulations can be raised to complicate their prosecution, nor can there be any further reason for leniency in instituting criminal action against persons who willfully violate the regulations. Experience has demonstrated that civil action is not always adequate to safeguard the Forests from further invasion, so that resort to criminal prosecution of persons who willfully and defiantly trespass upon them is necessary to give them adequate protection.

There occurred during the year 192 cases of grazing trespass, which is 43.86 per cent less than in 1910. The number of cases pending at the beginning of the year was 125, which included 9 cases not previously reported. Of the 317 cases, 101 were dismissed by the Forest Service, 9 were prosecuted, 99 were adjusted upon the payment of damages, judgment being secured by civil suit in a number of cases willful in character, and 108 were pending at the close of the year.

ADVISORY BOARDS.

Continued encouragement was given to the formation of local organizations of stock growers, and 12 new advisory boards representing organizations of this character were recognized during the year. A total of 68 advisory boards are now recognized, and cooperating effectively with the Forest Service in the settlement of grazing problems. The disinterested aid of the highly efficient representatives selected by the stock growers has been of great value.

One circumstance with which the district foresters have had to contend in their efforts to secure the organization of the stock growers has been the relaxation of interest on the part of the permittees as the gradual adjustment of grazing problems has removed the causes of dissatisfaction. Many fail to realize that organizations to promote their interests are as valuable as organizations to protect them, and where there is every prospect of the continued enjoyment of the present grazing privileges it is difficult to maintain active organizations; many associations have, in fact, practically disbanded. The Forest Service is at present entering new fields of scientific range management and is engaged upon problems of vital importance to the stock growers, who may, if they will, render cooperative assist-

ance which will gain for them benefits of far greater value than those hitherto secured. Continued cooperative assistance is therefore very desirable.

PERMITS.

Paid grazing permits were issued as follows:

State or Territory.	Cattle, horses, and hogs.				Sheep and goats.		
	Permits issued.	Cattle.	Horses.	Hogs.	Permits issued.	Sheep.	Goats.
Arizona.....	1,658	221,128	10,020	228	170	421,529	7,186
Arkansas.....	10	403		20			
California.....	2,382	151,582	9,824	3,867	298	368,781	13,464
Colorado.....	2,718	229,125	8,205		432	663,502	2,697
Florida.....	26	545		121	5	435	
Idaho.....	1,771	100,404	8,539	20	835	1,041,581	
Kansas.....	91	10,945	173			300	
Montana.....	1,948	128,478	16,114		348	640,362	1,100
Nebraska.....	92	42,648	1,625				
Nevada.....	344	45,120	4,780		78	433,467	1,200
New Mexico.....	1,881	99,177	6,715	184	663	445,916	51,641
North Dakota.....	13	415	120				
Oklahoma.....	39	4,701	229				
Oregon.....	1,225	94,803	9,049	60	538	875,524	365
South Dakota.....	472	14,322	2,276				
Utah.....	4,739	119,738	7,748		1,327	899,466	10
Washington.....	292	10,983	1,279		114	190,562	
Wyoming.....	798	77,345	4,820		296	790,322	
Total.....	20,499	1,351,922	91,516	4,500	5,105	7,371,747	77,668

The reductions from last year's totals amount to 57,951 cattle, 186,903 sheep, and 12,632 goats. The increases amount to 6,964 horses and 1,355 swine. The net reduction in the total number of animals grazed under permit was 2.72 per cent. These reductions in the number of stock grazed were due to two principal causes. One was the restoration to the unreserved public domain of 2,300,000 acres of land which, because of its relatively low altitude, accessibility, and high grazing capacity, comprised much of the best range. The other was the pronounced shortage, already mentioned, of all kinds of stock at the beginning of the season of 1911. Although the number of cattle and horse permittees is only 193 less than in 1910, a loss of less than 1 per cent, and the number of sheep and goat permittees is 110 greater than in 1910, a gain of 2.2 per cent, the average number of cattle and horses per permit is only 70.6 and of sheep and goats 1,459, as against 72 cattle and horses and 1,531 sheep and goats in 1910. In other words, the number of permittees remained practically the same as in 1910. The decrease in the amount of permitted stock caused by the eliminations and by voluntary reductions was largely in excess of the net reductions reported, but was offset by large increases in a number of States, made possible by the development of new ranges and by increases in the carrying capacity of ranges long occupied. The States in which increased numbers of stock were grazed and the increases made are as follows:

States.	Cattle.	Sheep.	States.	Cattle.	Sheep.
Colorado.....		68,500	Washington.....	1,500	25,500
Montana.....		63,400	Wyoming.....	4,300	
Nebraska.....	4,000		Total.....	16,600	161,400
South Dakota.....	2,400				
Utah.....	4,400	4,000			

The following is a report of permits issued, by grades, in 1911 and 1910:

CATTLE AND HORSE PERMITS.

	1911		1910	
	Number.	Per cent.	Number.	Per cent.
Grade 1—1 to 40 head.....	13,419	65.46	13,336	64.46
Grade 2—41 to 100 head.....	3,910	19.08	4,128	19.95
Grade 3—101 to 200 head.....	1,735	8.46	1,776	8.58
Grade 4—Over 200 head.....	1,435	7.00	1,452	7.02
Total.....		100.00		100.00

SHEEP AND GOAT PERMITS.

Grade 1—1 to 1,000 head.....	2,521	49.38	2,426	48.37
Grade 2—1,001 to 2,500 head.....	1,923	37.67	1,837	36.77
Grade 3—2,501 to 4,000 head.....	367	7.19	418	8.37
Grade 4—Over 4,000 head.....	294	5.76	314	6.29
Total.....		100.00		100.00

These statistics, like those given above, show a steady decrease in average holdings. This is partially the result of the recognition of numerous new owners, settlers within and adjacent to the Forests, effected by reductions made in the renewal of permits to purchasers of permitted stock and in a few cases by sliding-scale reductions upon all permits above certain limits; but to some extent voluntary reductions by permittees have swelled the lower and reduced the higher grades.

The percentage of approved applicants who failed to pay the grazing fees and utilize the privileges allotted to them was 7.8 per cent, exactly the same as during the preceding year.

The percentage of reduction in grazing receipts largely exceeds that in the number of stock grazed. This is undoubtedly attributable to the fact that most of the lands eliminated were available for grazing purposes during the major portion of the year, and consequently produced more than the average revenue. In other cases the eliminations divided individual ranges in such a way that the numbers of stock grazed under permit were not materially lessened, but the permits were issued for shorter periods, for which much lower charges were made. The receipts for grazing privileges during the year are stated on page 353. They show a decrease of \$51,419.

The plan to allot grazing privileges for periods of five years was effective upon 40 Forests at the close of the year, the system having been inaugurated upon 5 additional Forests. Its success in accomplishing the purpose for which it was designed—to give stability and permanency in the use of the range—has been complete, but the plan has been losing in popularity among the stock growers. Grazing conditions have become so well settled upon the large majority of the Forests that term applications are not essential to certainty of tenure, and the permittees realize this fact. As the term application prescribes a minimum as well as a maximum use of the range by the permittee, stock growers have in many instances considered it advantageous to relinquish their term permits in favor of annual

permits, holding that the greater freedom of operation allowed by the latter class more than offsets the greater degree of exemption from reduction afforded by the term permit.

Crossing permits to the number of 2,711 were issued free of charge to the applicants. These permits allowed 80,423 head of cattle and horses and 4,939,589 head of sheep and goats to be driven to private lands within the Forests or across the Forest lands to outside ranges or shipping points. While the number of permits increased by 3.7 per cent, the difference in the number of stock covered by them was negligible. Permits are not required where small bands of stock are driven along public highways or where the stock is not grazed upon Forest lands en route. Considering the large number of stock involved, there has been surprisingly little abuse of the crossing privilege and no injury to Forest interests has resulted. Stock growers suffered no embarrassment because of the requirements of these permits, and the free movement of stock was not hampered.

In some of the districts, notably districts 2 and 6, considerable attention was given to the division of the ranges by drift fences erected in cooperation with the stock growers, the Forest Service contributing the timber needed for the construction of the fences and in some cases the wire and staples. In other districts satisfactory cooperation could not be secured, and as there was pressing need for all available funds to prosecute other lines of work very few range improvements were constructed. At the close of the year preparations were being made for the removal of the sanitary drift fence, located on the western boundary of New Mexico, to the western boundary of the Peloncillo division of the Chiricahua Forest, where it will serve the double purpose of controlling the drift of cattle upon the Forest and of preventing the spread of Texas fever from the adjacent quarantine area. The most important drift fence erected was the Rabbit Ear fence, 15 miles long, located in the Routt Forest and constructed in cooperation with the North Park Stockmen's Association. A number of important fences were erected in the Deschutes Forest. The boundary drift fences upon the Alamo Forest, which by eliminations from that Forest were left upon the unreserved public domain, were condemned, sold, and removed during the year. The future expenditure of funds for range improvements will, except in extraordinary cases, be made where improvements are needed in order to carry out the grazing working plans which are being formulated for various Forests as detailed range reconnoissances furnish the necessary basis for systematic and scientific development of the range resource.

USE OF PRIVATE LANDS.

As in previous years, the owners or lessees of unfenced private land had the privilege of waiving the right of exclusive use of such lands and securing in return a free permit for the number of stock which the private lands would support under the regulations of the Secretary. By exercising this privilege such owners or lessees were relieved of the necessity for securing a free crossing permit, where the stock were to be grazed on the Forest en route, and of so handling their stock that it would not encroach upon Forest lands; consequently they could utilize their holdings at a minimum of expense. In addition

other permittees were freed from claims for damages, which in many States might follow the intrusion upon the private lands of stock grazed under Forest Service permits. Thus the plan resulted in the fullest and most economical use of the entire range. The permits of this class numbered 1,205, and allowed the grazing of 57,594 head of cattle and horses, 989 swine, and 392,592 head of sheep and goats. The owners of this stock waived the right of exclusive use of 2,418,202 acres of private land. The number of permits issued fell off 8.43 per cent, the number of cattle and horses increased 5.74 per cent, sheep and goats 4.89 per cent, and the number of acres of land increased 12 per cent.

Under the cooperative agreement previously in force with the Atchison, Topeka & Santa Fe Railroad Co. the Forest Service continued to advise the company as to the number of stock which may safely be grazed on its lands within the Zuni National Forest. An agreement is also in force with the Northern Idaho Forestry Association, composed of representatives of the State of Idaho and private owners of 94,000 acres of patented land in the Palouse division of the Coeur d'Alene Forest, under which persons grazing stock upon the Palouse division pay a part of the grazing fee to the Northern Idaho Forestry Association and a part to the Forest Service in proportion to the respective holdings of the association and the Service. The Weyerhaeuser Land Co. and the Northern Pacific Railroad Co. continued their informal cooperation with the Forest Service. While under no agreement to do so, both of these companies in leasing their lands within the National Forests give preference to Forest Service permittees who will waive the right of exclusive use in exchange for a permit under Regulation G-19. The Northern Pacific Co. also makes a practice of referring all applications for the lease of lands within National Forests to the district forester to learn whether the proposed lease will be detrimental to Forest interests.

PROTECTION AGAINST DISEASE.

Permittees who grazed their stock during a part of the year on outside ranges where communicable diseases injurious to live stock were known to exist were required to submit the stock to rigid inspection by representatives of the Bureau of Animal Industry, and to present certificates showing freedom from disease before placing the stock upon the Forest ranges. This requirement has been in effect for a number of years and as a result all but three of the National Forests are free from most forms of communicable diseases fatal to live stock. The principal inspection required during the year was to prevent the grazing of sheep infected with scabies upon certain Forests in Arizona, California, Colorado, Nevada, New Mexico, and Utah, practically the same area as that where inspection was required during the preceding year. By close attention to prevent the spread of lip and leg ulceration among the sheep occupying the National Forests in the State of Wyoming, it was brought about that no sheep left the Forests in the fall of 1910 affected with this disease. The discovery that cattle to be grazed upon the Routt Forest in Colorado and the Deschutes and Fremont Forests in Oregon were infected with cattle scabies necessitated an inspection of stock entering these Forests and the enforcement of dipping requirements prescribed by the

Bureau of Animal Industry. Reports of the existence of glanders among range horses, of the spread of anthrax among cattle, etc., were investigated by members of the Bureau of Animal Industry at the request of forest officers.

During the year the Forest Service assisted the Bureau of Animal Industry to construct a quarantine drift fence along the international boundary in California, the greater part of the fence being within the Cleveland National Forest. Its purpose is to prevent the intrusion from Mexico of cattle infested with the Texas fever tick.

The Wichita Forest in Oklahoma, being south of the quarantine line, has since its creation been so infested with Texas fever ticks that heavy losses have occurred among domestic animals introduced from other States, and the welfare of the game animals within the game refuge, particularly the buffalo and elk, has been seriously threatened, three head of buffalo having died of the disease shortly after arrival at the refuge several years ago, and losses among the remaining buffalo being prevented only by constant attention and the spraying of the animals at frequent intervals. Plans were therefore made, in cooperation with the Bureau of Animal Industry, to free the forest from ticks. The permittees provided five dipping plants and adequate facilities for the dipping of all cattle within the Forest, and the Forest Service provided all material needed for the construction of the fences required to divide the ranges and control the stock. The dipping of the cattle was under the direction of the Bureau of Animal Industry, and at the close of the year arrangements for the dipping of all stock were well under way.

The Arkansas and Ozark National Forests are both situated south of the quarantine line and well within the Texas fever zone; stock holdings are small and scattered; and the work of tick eradication within the Forests difficult and costly. For these reasons, there has been no effort made to free these Forests from ticks. The forest officers and members of the Bureau of Animal Industry have, however, succeeded largely in counteracting the local belief that the tick can be controlled by burning over the lands each year, and the number of fires set for that purpose has been materially reduced.

The relations between the Forest Service and the stock sanitary boards of the different States were entirely harmonious, and the Service cooperated fully in the enforcement of State sanitary regulations. Cooperation with the Colorado State Board of Health consisted in posting State sanitary notices throughout the National Forests of the State and bringing to the notice of all Forest users the requirements of the State sanitary laws.

PROTECTION AGAINST WILD ANIMALS.

Forest officers killed the following animals harmful to live stock and to game animals:

Predatory animals destroyed.

States or Territories.	Bears.		Mountain lions.		Wolves.		Wolf pups.		Coyotes.		Wild cats.		Lynxes.		Total.	
	1910	1911	1910	1911	1910	1911	1910	1911	1910	1911	1910	1911	1910	1911	1910	1911
Arizona.....	16	15	41	33	12	16			273	288	114	110	56	10	512	472
California.....	73	37	23	5	2	3		2	903	743	309	193	37	15	1,347	1,998
Colorado.....	12	11	3	8	6	31	11	25	613	1,008	88	70	3	2	736	1,155
Idaho.....	31	25	10	1	30	21			1,177	1,328	90	52	3	3	1,341	1,430
Minnesota.....	2	1													2	1
Montana.....	35	20	7	1	38	12	105	5	459	183	33	15	10	3	687	239
Nebraska.....									30	49					30	49
Nevada.....									39	137	3	5	2		44	143
New Mexico.....	9	33	6	28	24	67		11	1,238	250	104	77	6	23	1,387	489
Oklahoma.....									27	45	14	58			41	103
Oregon.....	47	23	1	4	6	3	6		960	743	64	108		4	1,084	885
South Dakota.....										33						33
Utah.....		2	1	2	2	11			1,185	1,289	292	125		3	1,480	1,432
Washington.....	38	40	6	3	1			6	11	83	35	19	12	4	103	155
Wyoming.....	8	6		2	8	8	26	20	242	308	23	38	2	5	309	387
Total.....	271	213	98	88	129	172	148	69	7,157	6,487	1,169	870	131	72	9,103	7,971

¹ Also 2 wolverines and 6 foxes, or total of 1,006 animals for California.

The total number killed was 12.5 per cent less than in 1910. There was a falling off of 21 per cent in the number of bears, 10 per cent in the number of mountain lions, 53.5 per cent in the number of wolf pups, 11 per cent in the number of coyotes, 25 per cent in the number of wild cats, and 45 per cent in the number of lynxes. There was, however, an increase of 25 per cent in the number of grown wolves killed. These reductions are probably due to a general reduction in the number of predatory animals infesting the National Forests and adjacent ranges. The work has served as an example and a stimulus to the settlers within and adjacent to the Forests, who have themselves killed many thousands of animals. On the Wallowa National Forest, in Oregon, the spread of rabies among the coyotes during the summer of 1910 caused widespread apprehension and resulted in serious losses of live stock. At the request of the settlers, the district forester assigned several of the best qualified forest officers in the State to the work of destroying the coyotes. They were so successful that this spring some of the permittees allowed their lambing bands to graze unattended throughout an entire day without suffering any loss whatever from wild animals, a condition practically without precedent in the history of the country.

The work of clearing the ranges of prairie dogs continued until the latter part of the year, when arrangements were made with the Biological Survey to take over the work. The natural distribution of the dogs is mainly within districts 2 and 3, and most of the work performed was within these two districts. The treated areas have not been entirely freed from rodents, but the prairie dogs have been so reduced in number that they can no longer completely denude the lands occupied.

PROTECTION AGAINST POISONOUS PLANTS.

Practically no reports of losses of live stock because of poisonous plants were received, although in previous years reports of this character were numerous. The cooperative work conducted by the Forest Service and the Bureau of Plant Industry has resulted in the determination of the plants which have hitherto caused the greatest losses of live stock and the location of the most important areas within which they occur. As the poison areas are located, they are marked with warning notices. One member of the Bureau of Plant Industry has been steadily engaged in making investigations of ranges reputed to contain poisonous plants.

FORAGE AND RANGE INVESTIGATIONS.

During the year the technical and scientific features of the grazing work were greatly enlarged in scope and 5 new members were added to the force employed. The field for study and improvement is a wide one, each year's experience demonstrating more convincingly that the prevailing methods of handling live stock upon the Forest ranges are economically wasteful and needlessly destructive. It is apparent, too, that the public welfare is best subserved by the determination of means of correction and cure, rather than by the exclusion of the stock from the Forests. The problem in general presents three phases: (1) The restoration of depleted ranges to a normal condition of productivity; (2) the development of unused resources, and (3) the conservation and economical utilization of all resources.

To secure an adequate basis for the immediate and future utilization of the forage products of the Forests along lines most productive to stock growers and least injurious to other interests, there is need for a careful and thorough reconnaissance of each Forest under the direction of men technically trained, experienced in methods of handling stock upon open ranges, and thoroughly qualified to determine all factors influencing range management, either favorably or adversely. This work is well under way. It will aim to determine the character of all land within the Forests, the kind of stock to which each natural grazing unit is best adapted, the natural periods of use for grazing purposes, the undergrazed, fully grazed, and overstocked ranges, the areas upon which poisonous plants abound, and the areas infested with range-destroying rodents. Grazing working plans will be prepared from the data secured by these reconnoissances. They will serve as a guide in the allotment of grazing privileges, the determination of improved methods of range control, and the improvement of the ranges. Already the grazing management of several Forests has been materially improved as a result of these studies. Detailed reconnoissances were inaugurated on the Coconino, Deerlodge, Medicine Bow, and Targhee Forests.

The series of experiments to determine the feasibility of lambing sheep in small inclosures, which was initiated upon the Cochetopa Forest in Colorado during the spring of 1910, was continued throughout the year, fairly conclusive results being secured. It was demonstrated that under conditions comparable to those governing the experiments, the pastures would effect a saving of lambs and labor, which during the life of the improvements would more than offset

the cost of construction and maintenance, and would largely obviate the losses often sustained through inability to secure the necessary labor at lambing time. The areas upon which sheep may be successfully lambled are limited and in great demand. Under existing methods lambing on the range is unusually injurious to the areas used, losses are large, and the operation is expensive; consequently, the determination of a method by which sheep may be lambled upon small areas with a maximum percentage of increase, a minimum cost, and a minimum of damage to the Forest lands, will be of large importance.

The coyote-proof pasture experiment, which for four years past has been conducted upon the Wallowa National Forest, was continued during the year. The sheep were handled by a regular herder without assistance by the Forest Service, and the results show the same reductions in expense, in amount of range required, and in percentage of natural loss, and the same increase in weight of the lambs, as was secured in preceding years.

The experiments in reseeding the ranges with introduced grasses were widened. Over 300 experimental sowings were made in the calendar year 1910. The drought which prevailed throughout the Western States militated against successful results. The season of 1911 will afford a better test of what can be done.

In connection with the study of the mountain bunch grass range types, preparations were made for the application of the rotation or deferred grazing system upon 10 overgrazed sheep allotments, investigations having demonstrated conclusively that by proper rotation in the use of grazing lands it is possible to secure a thorough natural reseeding of certain classes of land at intervals without any serious decrease in the amount of forage available for use. Experiments to discover ways by which a natural reseeding of native plants upon other depleted ranges could be secured were initiated upon several Forests by the local officers. Upon the Hayden Forest the experiments included studies of the effect of alternate grazing, limited grazing, and total exclusion of stock.

Closely allied with the preceding study is that of the effect of soil acidity or alkalinity upon the growth of forage plants. Both laboratory and field investigations were initiated during the year.

An important study was undertaken at the Coconino Experiment Station of the effects of stock grazing upon forest reproduction. This study has now been extended to the Shasta Forest, and valuable results are anticipated.

GAME PRESERVES.

The status of the Wichita and Grand Canyon National Game Refuges remained unchanged during the year. The efforts to protect the wild game from slaughter and molestation within their natural breeding grounds were wholly successful, and through the extermination of their natural enemies, proper restriction of grazing, and enforcement of the law through the maintenance of an active and thorough patrol, all species of game animals and birds multiplied encouragingly.

The buffalo herd on the Wichita Game Refuge now numbers 30 head—double the original number. Through the courtesy of the Boone and Crockett Club a shipment of antelope was received, of which 7 head survived and are in thriving condition, 1 fawn having

been born since the arrival of the antelope. During the spring 5 head of elk were received from Wyoming, making a total of 6 head now within the game refuge.

In addition to the national game refuges a number of State game preserves are included within the National Forests. By State law the Minnesota and Superior Forests are State game preserves, the killing of all classes of game being prohibited. The last session of the Montana Legislature established a State game preserve at the head of the Gallatin River in the Gallatin National Forest. Other areas where the killing of game animals is prohibited by State law are: One within the Bighorn National Forest; one within the Teton and Targhee National Forests; one within the Boise National Forest; and one within the Monterey National Forest. In practically all of the Forests containing State game preserves, the forest officers hold commissions as deputy State game wardens and play an important part in the enforcement of the State laws.

PERMANENT IMPROVEMENTS.

The purpose of the construction of permanent improvements on the National Forests is to facilitate (1) protection from fire, (2) the administration of the business of the Forests, and (3) the development of their resources. A complete system of communication by trail and telephone, tying together all parts of a National Forest, is as essential for its protection as an adequate patrol force. The administration of the Forests requires the construction of quarters for field officers and facilities needed in the regulation of the use of forest resources, such as drift fences and sheep-counting corrals. The development of the resources of the National Forests demands, in addition to the primary system of communication, the construction of roads and of stock-watering facilities and similar appliances, often needed to make forage and other latent resources available for use. Such improvements, while developing and increasing the value of the National Forests as public property, are made primarily with reference to the immediate needs of the local public in their use.

The completion of the primary system of communication, a fundamental factor in fire protection, has been and must for many years be the chief effort of the Service in the construction of improvements. All other ends sought must be subordinated to this.

A limited amount of improvement work can be done with the labor of regular employees during short periods when their administrative and protective duties will permit. The spare time of the present force, however, is hardly sufficient to maintain existing improvements in serviceable condition. It has been necessary, therefore, to meet the cost of nearly all of the new construction work on National Forests from the specific appropriations for this purpose.

The improvement appropriation for the fiscal year 1911 was \$275,000, as against \$600,000 for the preceding year. It amounted to but \$1.08 per square mile on the total acreage of National Forest land. Over one-fifth of the amount appropriated was required for needed repairs and the remaining funds were but two-fifths of the amount available for new construction in the preceding fiscal year.

Only the most urgent projects could be taken up. Most of the work related directly to improved fire protection. With 60 per cent

less money available for new work, the mileage of telephone lines constructed was but 24 per cent less than in 1910 and that of trails and fire lines 36 per cent. Special allotments to the Forests swept by the disastrous fires of 1910 were necessary to provide for the reconstruction of ranger stations, bridges, and fences.

The work done during the year comprised 1,383 miles of trails, 125 miles of roads, 1,427 miles of telephone lines, 163 miles of fire lines, 376 miles of fences, 372 cabins and barns, 50 bridges, and 47 corrals. The reduced appropriation and the necessity of concentrating upon protection facilities diminished the amount of work done in cooperation with States, communities, and private associations or individuals. Such cooperation was practically limited to means of communication. As in previous years, the contributions made by the Service to cooperative projects formed but a small proportion of their total cost. Sixty miles of telephone line were completed on the Targhee National Forest, in cooperation with the Yellowstone Power & Telephone Co., at a cost to the Service of \$867.97. This line will be maintained by the cooperating company for 5 years. Eleven miles of telephone line were constructed cooperatively on the Cache National Forest, and 20 miles on the La Sal National Forest, at costs of \$164.60 and \$50, respectively. Eight miles of telephone line were similarly built on the Manzano at a cost of \$106.19, and 6½ miles on the Klamath National Forest at a cost of \$51.30. Eight miles of road on the Monterey Forest were constructed at a cost to the Service of \$82.69. In but few cases of the most urgent character were cooperative projects undertaken which involved work for purely administrative uses. The Service was forced to reject a large number of offers of cooperation in the construction of roads and other improvements of great benefit to the National Forests, because of the necessity of limiting expenditures strictly to improvements most needed in bettering protection from fire.

With relatively small appropriations available from year to year it is difficult to avoid an uneconomical, piece-meal system of repairs and construction, taking up the most urgent work here and there without correlating the work completed and proposed. Special effort has been made to avoid this danger. A systematic plan exists for the complete equipment of each National Forest with communications and administrative facilities. As far as practicable each new piece of work authorized is in line with the approved plan; but in each case the work to be given first preference will be that directly contributing to fire protection. A comprehensive scheme of main and secondary trails and telephone lines, a system of lookout points or watch towers covering all of the areas where this method of fire control is feasible, fire lines at strategic points, such as wooded passes which form breaks in natural barriers and along the edges of dangerous slashings, and tool caches distributed throughout inaccessible areas are the most essential features of the improvement plan. Attention will next be given to structures required for the accommodation of forest officers and for the proper control of present uses of the Forests. Improvements designed to meet the third general purpose, viz, the development of the resources of the National Forests, must necessarily progress very slowly, in view of the greater urgency of the other work.

The adequate development of the enormous latent resources of the National Forests, particularly the construction of roads and other means of transportation which will be needed to overcome their inaccessibility, will require ultimately very large expenditures. In many localities there is an insistent demand for such improvements at the present time. It will be impossible for the Service to comply with this demand until the equipment needed in its protective and administrative work is completed. The undertaking of construction work designed to open up the inaccessible resources of the National Forests will depend furthermore upon the future policy adopted as to the extent to which such development should be a matter of public as against private enterprise.

Including the last fiscal year, the permanent improvements constructed on the National Forests since they were placed under administration aggregate 1,325 miles of road, 9,163 miles of trail, 7,381 miles of telephone line, 350 miles of fire line, 2,327 miles of fence, 1,338 houses, 775 barns, 280 corrals, and 271 bridges. With 256,000 square miles of National Forest land under administration, exclusive of Alaska and Porto Rico, the facilities for communication completed up to the present time amount to 0.19 mile of road, 1.29 miles of trail, and 1.04 miles of telephone line per township of 36 square miles. The funds available during the past year made possible the construction of 0.018 mile of road, 0.19 mile of trail, and 0.2 mile of telephone line per township. The inadequacy of these improvements for the protection of the National Forests is apparent. At least 10 miles of trail and 6 miles of telephone line per township are necessary to place the protection of the National Forests upon a sure footing. The current appropriation (fiscal year 1912) may permit, by practically eliminating the construction of other forms of improvements, the building of a maximum of 0.6 mile of trail and 0.3 mile of telephone line per township, besides necessary expenditures for the maintenance of existing structures. At this rate 15 years will be required to complete the fundamental communication facilities needed for an efficient protective organization.

EXAMINATION OF LANDS UNDER THE WEEKS LAW.

The act of March 1, 1911, commonly known as the Weeks law, provided for the acquisition of forest lands on the watersheds of navigable streams in order to promote and protect their navigability through forest preservation. The act imposes upon the Forest Service new duties in the selection of the general areas for purchase, in the examination and valuation of the lands and forest growth to be acquired, and in conducting the negotiations for purchase. The work being different from any before done by the Forest Service, it became necessary for its handling to create a new unit of organization. The immediate control of the work was placed in charge of an assistant forester and an organization was effected for making the necessary examinations and reports. Since \$2,000,000 were made available for the fiscal year 1911, an attempt was made to examine as much land as possible with a view to its purchase before the end of the year.

From the information which had been gathered during the past 10 years it was possible for the Forest Service to designate at once

several areas within which to invite offers of land. A circular describing these areas, announcing the procedure to be followed, and inviting proposals for the sale of lands to the Government was issued on March 27.

From April 1 to June 30 proposals were received covering 1,250,641 acres, of which 832,464 acres were within the general areas which had been selected for purchase. The examinations of the Forest Service prior to June 30, 1911, covered 140,787 acres.

At the beginning of the year 1912 the Service has a force of 35 examiners working, and will undoubtedly be able to complete reports and recommend purchase of lands to the full amount of the \$2,000,000 available.

STATE AND PRIVATE COOPERATION.

The work of the past year in cooperation with States and private timberland owners consisted of (1) cooperative field investigations with State organizations; (2) cooperation with States in the protection of watersheds of navigable streams from forest fires, under the Weeks law; and (3) a limited number of examinations of individual timber tracts for the purpose of advising their owners as to better methods of management.

The cooperative field investigations were for the most part in Southern States and in continuance of projects started in 1909 and 1910. They included studies of the forest resources of South Carolina, Mississippi, Louisiana, Florida, Tennessee, North Carolina, Virginia, and Illinois. These investigations were made primarily in order to provide a basis for the development of a practicable and enlightened forest policy by each State.

In October, 1910, at the request of the flood commission of Pittsburgh, the Service undertook, in cooperation with the Pennsylvania department of forestry, a detailed examination of the forest conditions on the Allegheny and Monongahela watersheds. The area covered approximates 18,000 square miles. The object of the study was to ascertain how far erosion and floods are due to forest conditions on these watersheds, and what measures for their improvement would be practicable. The report and map will be published by the flood commission.

In cooperation with the State forester of Connecticut, a study of second-growth hardwood stands, which comprise the major portion of the woodland of that State, was made during the summer of 1910. The objects of this study were to obtain reliable information on the yield of stands of this character in different periods, to determine prevailing market conditions in the State which govern the value of such timbers, to ascertain the effect of thinnings upon the rate of growth, and to recommend practicable measures in the management of second-growth woodlands to increase their productive capacity and the value of the product.

The most important work of the year was in pursuance of section 2 of the Weeks law, which appropriated \$200,000 for cooperation with the States in protecting the forested watersheds of navigable streams from fire. Such cooperation is extended only to States which have provided by law for forest-fire protection and have appropriated funds for that purpose. The amount expended by each State must at least equal that spent by the Federal Govern-

ment. Prior to July 1 agreements were entered into by the Secretary of Agriculture, specifying as the maximum amounts to be spent by the Government during the remainder of the calendar year, if needed, the following: In New Hampshire, \$7,200; in Minnesota, \$10,000; in New Jersey, \$1,000; in Wisconsin, \$5,000; in Maine, \$10,000; and in Vermont, \$2,000.

After the close of the fiscal year similar agreements were concluded providing for a maximum expenditure of \$1,000 in Connecticut, \$5,000 in Oregon, \$600 in Maryland, \$1,800 in Massachusetts, and \$2,000 in New York.

The Federal funds were to be expended in each instance for the salaries of patrolmen exclusively. Cooperative agreements were entered into only after the State had submitted a fire plan and a map showing in detail the number and location of the protective force to be employed, the location of telephone lines, lookout towers, and other structures forming a part of the protective system, the amount of State funds to be expended for various features of the protective system, and how the Federal moneys allotted to the State would be used to supplement State expenditures. The agreements provide for inspection, by officers of the Service, of the operation and efficiency of the cooperative protective system.

Past experience in examining woodlots and privately owned timber tracts has shown that the methods of forestry recommended are actually put into effect in far too small a percentage of cases. While the educational value of the cases where forestry is practiced is very great, it is important to increase their number. An attempt to do this is now made by giving greater attention, in the investigation made and reports submitted to owners, to the pecuniary advantages of good over poor methods of management, and by studies of market conditions in order to show owners how best to dispose of the products of their woodlands. Primary consideration is given to the applications and needs of small owners, since they are more disposed as a rule to put the methods recommended into operation.

As the number of State and private foresters increases, cooperation with private owners is being gradually restricted. The needs of applicants from States in which it is still difficult to secure expert information and advice are, however, so far as possible, provided for. Examinations of a single woodlot in a locality are not ordinarily made. Instead the interest of several owners in a community is sought by informing applicants that a field examination will be made upon a joint application signed by a number of owners in the same locality. The cost of such examinations is shared by the owners, on an acreage basis. In connection with such examinations studies are usually made of market or other conditions which apply to the community as a whole, and of the possibility of cooperative shipments of forest products. Public meetings with discussions of local forestry problems, the distribution of publications, the formation of local forestry clubs if advisable, and the collection of additional data needed for Service publications are valuable features of this work.

As a result of many field examinations and general studies it is often possible to furnish the advice and assistance needed by an individual owner by letter. This policy is especially applicable in cases of requests for advice on tree planting, a field well covered by

the data formerly collected and by publications. Field examinations where planting is intended are made only in exceptional cases, where the work can be cheaply done in connection with woodlot examinations or where data of distinct value to the service can be secured.

OTHER INVESTIGATIONS.

SILVICULTURAL AND DENDROLOGICAL STUDIES.

During the year commercial tree studies of eastern white pine, aspen, balsam fir, red spruce, Norway pine, and yellow poplar were completed. The results of these studies will appear as monographs dealing with the range, silvicultural characteristics, growth, yield, and management of each tree. Thus the study of the aspen, already published, brings together for those interested in aspen lands the most important facts regarding aspens, including the industrial uses of the wood, the conditions under which the tree succeeds, the rate of growth in different situations, the most suitable methods of management to secure increased returns, etc. Tables showing the volumes of aspen trees of different sizes, in cubic feet and in cords, and the number of trees required to make a cord are also given.

An economic study was made of the species of wattles, or acacia, most valuable for tanbark and timber. Many species have been successfully cultivated in California from 20 to 50 years, none of which, however, have been planted on the commercial scale which their intrinsic value and their adaptation to large areas justify.

The investigations in basket-willow culture were developed considerably. Willows can best be grown as a secondary crop. The land suited to them usually occurs as small areas, which are very commonly parts of farms valuable in the main for the production of other crops. Yet though a very insignificant fraction of the total farm area may be suited to willow culture, its use for this purpose is likely to mean a crop of high acreage value, obtained from land which otherwise might yield almost no return. For this reason it is well worth bringing to the attention of farmers. For a number of years the Forest Service has been distributing willow cuttings to applicants, with advice concerning the best cultural methods.

From 100 to 200 cuttings of the standard varieties are given each applicant. They are grown at the Arlington farm of the Department of Agriculture, from imported stock; for hitherto European varieties have furnished the material for fine basket making in the United States. But to secure varieties suited to different regions in this country it is desirable to discover or breed species or varieties not now in use. With this object in view cuttings of practically all of the native species of willow, and of a number of exotic species, are being propagated at Arlington to obtain rods for a test of their suitability for basket making. If necessary, the development by hybridization of new strains, better suited to American conditions than the European varieties, will be undertaken.

The cuttings distributed in 1911 totaled 84,800, of which 20,000 went to 40 agricultural experiment stations, 13,000 to forest schools, 30,000 for use in connection with cooperative work with the State of New Jersey, 20,000 to individuals, and 1,800 to botanical gardens. The distribution included 46 States and Territories. The Forest Serv-

ice is cooperating in willow culture with the Maryland and Virginia Agricultural Experiment Stations and with the State of New Jersey.

Fundamental facts and principles of value to the profession and the science of forestry were yielded by a study, completed and published during the year, which brings together all the facts known with regard to the part which light plays in the life of the forest. This includes the results of investigations at the Forest Service experiment stations. An investigation of the forest regions of the United States, with special reference to the laws of distribution and the fundamental laws of tree growth, was started.

The preparation of silvical leaflets was continued. Material for 42 leaflets was prepared. These leaflets both give forest officers in concise form much valuable silvical information and form the only, and an invaluable, source of information for students in forest schools on the silvicultural requirements of western species.

Dendrological studies of the structural characteristics of woods furnished material for publications dealing with fustic dyewood and its substitutes and adulterants and with "Colombian mahogany." Both the subject of dyewoods and that of the many woods now sold as mahogany, with the result that no standard exists beyond an arbitrary judgment as to whether or not mahogany has actually been furnished the purchaser, were investigated further. These investigations are minor examples of a line of work which aims to obtain the means of identifying all important woods in their commercial forms.

The distinguishing characteristics of North American gum woods and of the important North American oaks were dealt with in two bulletins published after the close of the fiscal year, and various other publications are under way or planned. Information on this subject was furnished by letter in response to many inquiries; over 500 wood samples were thus identified for manufacturers and other wood users. Studies in the geographical distribution of American forest trees were continued. Some of the data gathered and previously on hand furnished the basis for 501 folio record maps, which were prepared with reference especially to the needs of forest officers, and 17 folio maps were prepared for the use of the Forest Products Laboratory to show the range of certain eastern forest trees. One such map was prepared for publication by the Bureau of Plant Industry. The first of a series of forest geographical atlases, which when finished will form a complete atlas of North American trees, was prepared; the range of our native pines was presented on quarto size maps. The second volume in the series dealing regionally with the forest trees of the United States, which will be entitled "Forest Trees of the Rocky Mountains," was brought to an advanced stage of preparation.

STUDIES OF FOREST PRODUCTS.

The work in forest products was put on a new and greatly improved basis through a complete reorganization, planned with a view to utilizing to best advantage the new facilities afforded by the Forest Products Laboratory. This laboratory made possible the concentration of work previously scattered, with a corresponding gain in efficiency. The new laboratory was opened at Madison, Wis., in

June, 1910. Furnished with the most complete modern equipment and with a well-organized staff of experts, the Service is now able to conduct its research work in forest products with an effectiveness impossible under the old conditions.

The work as now organized comprises studies in the physical properties of wood, the drying of wood, strength tests, wood preservation, wood distillation, wood pulp and paper, naval stores, and wood utilization.

THE PHYSICAL PROPERTIES OF WOOD.

The laboratory aims not only to obtain facts regarding the qualities of wood and their behavior under different conditions, but in all cases to find the underlying causes. Structural characteristics explain the peculiar mechanical properties of a given wood. Explanation of the fact that different species require very different preservative treatment is found in differences in their physical qualities, as shown by the microscope. A study of the structural qualities of the various woods, therefore, is carried on side by side with the strength tests, the preservative tests, and the other investigations.

As a means of carrying out these studies there were prepared during the year about 1,000 microscopic slides, representing 74 different species.

To determine the ability of wood to withstand the strain of continuous loads to which its use in structural work subjects it, a series of dead-load tests was made, supplementing similar tests previously made on long-leaf pine. A series of determinations of the specific gravity of the solid matter in different woods is under way. The density of wood, which determines many of its physical and mechanical properties, depends upon the relative amounts of solid matter and open spaces; knowing the specific gravity of the former, the amount of the open spaces may be calculated.

Very little is known concerning the behavior of wood when subjected to high pressures and high temperatures or to various other conditions of the surrounding medium. Preliminary tests indicate that the strength, density, and hardness as well as the hygroscopicity of wood may be greatly affected by such conditions. They also indicate that by a proper manipulation of the treatment it is possible to entirely penetrate with preservative fluids spruce, hickory, and other woods which in their natural state are relatively impervious to injection.

The hygroscopicity of woods is of prime importance, both in connection with kiln-drying and in all cases where shrinking and swelling, or "working," of the wood after manufacture enters into the problem of its use. This subject was studied in preliminary tests. The specific heat of wood was studied in a series of careful experiments. This is the first time that this subject has been investigated in a comprehensive manner. The results show that the specific heat of all woods is approximately the same irrespective of species, the mean value between 0° C. and 106° C. being 0.327. These results are of considerable scientific importance and will prove of value in the experiments being conducted on the kiln-drying and preservative treatment of timber products.

DRYING OF WOOD.

In continuation of past studies of air seasoning, experiments were made with eucalyptus. The data obtained show the rate of seasoning and the extent of checking in trees cut in different localities and at different times of the year. The primary object sought is to learn how to get the best results when eucalyptus is to be cut for poles and piling.

Because of the time required to air-season wood artificial methods of drying are almost universal, especially for high-grade lumber. All such methods have proved more or less imperfect, and it is conservatively estimated that 10 per cent of the material dried in kilns is ruined or greatly lowered in value by excessive checking and warping. To study the fundamental principles of drying in kilns operated at atmospheric pressure an experimental kiln was erected, so designed as to secure control of the temperature, air circulation, and humidity, the three elements upon which the drying of lumber depends. A small commercial kiln embodying the same principles of construction, erected by a private company at Oakland, Cal., will make possible experiments to determine the best methods of kiln-drying different species of eucalyptus.

Arrangements were also made for a series of experiments to perfect methods of kiln-drying hickory stock used by the vehicle and implement industries. At present it is necessary to air-season most of the hickory stock used by these industries, with considerable loss from the attacks of wood borers and with added expense for handling.

STRENGTH TESTS.

The timber-test investigations of the year may be divided into three general classes:

(1) Standard tests upon the commercial timbers of the United States to determine their relative strength, stiffness, toughness, hardness, cleavability, and other mechanical properties. The knowledge thus gained enables manufacturers and other users to employ the different woods most advantageously, and often to substitute less well-known woods for woods which are becoming scarce. The tests in this class are made on clear specimens of comparatively small size.

(2) Tests on structural forms and sizes of timber, to furnish engineers and architects with data on the strength and other mechanical properties of woods used in construction, particularly as regards species and classes of wood which are not fully utilized.

(3) Tests to determine the influence of preservative treatments, methods of seasoning, and other processes on the mechanical properties of wood.

A plan for the comprehensive study of the commercial timbers of the United States provides for the securing of data which not only will show the relative mechanical properties of the different species studied but also will be of great value in determining under what conditions of growth the best wood is produced in a given species. Tests were made upon white oak, red oak, and white ash from Louisiana; black spruce, white spruce, red spruce, and balsam fir from New Hampshire; and red oak, white ash, rock elm, and hard maple

from Wisconsin. Specimens of other species for future tests were secured from the Ohio River Valley and the Rocky Mountain region.

Tests to determine the strength of bridge stringers and car sills, and to determine the effect of knots and checking on the strength of such timbers, were completed during the year. Tests were also made of Douglas fir stringers and joists cut from fire-killed timber, of which enormous quantities are going to waste in the West. The tests show conclusively that fire-killed fir, if manufactured into lumber before it is attacked by insects and decay, is practically as good for structural purposes as material secured from the living tree.

Much of the timber growing at high altitudes in the Rocky Mountain region is too small for the manufacture of lumber and other saw-mill products, but is used in mining and miscellaneous construction work. The supply of Douglas fir, until recent years almost entirely depended upon throughout Colorado and Wyoming for mine timbers, is now growing scarce in the vicinity of most of the mining camps, and other species must be used. To aid in meeting this situation, tests were made to find out whether fire-killed timber could be advantageously used, and to determine how lodgepole pine, Engelmann spruce, bristle-cone pine, western yellow pine, and Alpine fir compare in strength with Douglas fir. The results will shortly be available. Tests made primarily to ascertain the value of lodgepole pine and Engelmann spruce, as compared with red cedar, for telephone and telegraph poles showed that lodgepole pine was approximately 80 per cent as strong as red cedar and that Engelmann spruce may therefore frequently be used to advantage in lighter construction work.

The increasing use of bridge timbers treated with coal-tar creosote has made the question of the influence of such treatments on the strength of the stringers one of considerable importance to bridge engineers. A series of tests to determine the effect of preservative treatments with creosote on the strength of yellow pine and Douglas fir stringers, started in 1908, is now nearing completion.

Much damage is caused annually by the staining of yellow-pine lumber. Various chemicals, principally bicarbonate of soda, are used to prevent such stain. There were many objections to the use of material treated in this manner, because it was claimed that the treatment affected the mechanical properties of the wood. A series of tests made in cooperation with the Yellow Pine Manufacturers' Association to ascertain whether or not this contention was justified showed that the treatment has no appreciable effect upon the properties of yellow-pine wood.

WOOD PRESERVATION.

In 1910 the amount of wood treated in the United States exceeded 100,000,000 cubic feet; this was over 500 per cent more than that treated in 1904. The rapid extension of wood preservation into new fields and the treatment of new woods have developed many practical problems concerning which little or nothing is known; in fact, the whole industry is of such recent development that the knowledge of the fundamental principles upon which it is based is very meager. The wood-preservation investigations of the Forest Service may be divided into the following classes:

(1) The study of different preservatives in order to determine their toxic properties and their relative value for the preservative treatment of wood under different conditions of use.

(2) Studies of methods of impregnating wood in order to determine the best mechanical method of injecting the required amount of various preservatives into different species of wood.

(3) The application of wood preservation to permanent improvement work on the National Forests, and assistance to outside parties in applying the principles to the commercial treatment of timber.

(4) The inspection of treated test timbers set to determine their durability under different conditions of use when treated with various chemicals and by different methods of treatment. While logically this would be included under class 1, the amount of time put upon this work and the importance of the results secured make it worthy of special mention.

In studying preservatives, their chemical and physical properties, the ease with which each kind can be forced into the wood, its toxic properties, its effect upon the strength and other mechanical properties of wood, and its effect upon the inflammability of wood are learned. Very little systematic work of this kind has ever been done, and the results now being obtained are proving of great service in determining the relative value of different preservatives for the treatment of wood under different conditions of use. Several pieces of special apparatus have been developed for conducting these tests, the most important of which are the fungus pit and apparatus for studying the manner in which preservative fluids penetrate the wood. The fungus pit is a concrete chamber beneath the floor of the laboratory, 10 feet by 20 feet in size. This chamber is divided into compartments, in which the temperature and humidity of the atmosphere can be regulated. In the compartments specimens of various kinds are subjected to attack by vigorous growths of wood-destroying fungi. By means of the fungus pit it is possible to secure records of the durability of treated and untreated woods in much less time than under natural conditions. Thirty of the most promising wood preservatives, including practically all those commercially important at the present time, are now being studied.

To determine how piling may best be protected against the attack of marine organisms, sections of piles treated with different preservatives and protected in various mechanical ways, set in San Francisco Bay and in San Diego Bay, are being examined periodically and notes taken on their condition. These experiments, which must continue through at least two or three years, and possibly longer, will be of great assistance to engineers and others concerned with construction work in waters affected by the teredo and limnoria.

An important investigation has been undertaken to determine the relative efficiency of different fractions of creosote. Commercial creosote is a mixture of a number of different oils, varying widely in their chemical and physical properties, and it is important to know what constituents are most effective in protecting woods from decay and other destructive agencies. A representative commercial creosote was distilled into a number of fractions so as to separate the different classes of oils of which it is composed, and specimens of loblolly pine were treated with different quantities of each. Some of the treated specimens are exposed to the attack of marine organisms,

others to wood-destroying fungi. These test specimens are being inspected in the same way as the treated piles already described.

Experiments under way in cooperation with the agricultural department of the University of Wisconsin, to ascertain whether or not treated wood in silos would affect the quality of the silage, indicated a probability that treatment can be used to lengthen the life of the wood and to permit cheaper woods to take the place of the expensive woods now employed.

The structure of different species of wood varies widely, some having so many open ducts that it is possible to force fluids into them with great ease, while other species are very resistant to the fluids. A correlation of the structure of woods with the best methods of treating them with different fluids was sought through tests which should also be of value in connection with the wood-pulp investigations.

Experiments in the open-tank treatment of paving blocks were made in cooperation with the University of Washington. Wood paving blocks when properly treated make an excellent pavement for streets. If blocks can be treated by the inexpensive open-tank method, their use for paving might be widely extended, especially in small municipalities distant from commercial treating plants but at the same time having an adequate supply of cheap wood.

Demonstration work is carried on by the Service to verify experimental results on a commercial scale or to assist in the practical application of processes with which the laboratory is thoroughly familiar. It is frequently possible to secure in this way important new data. Usually this work is carried on in cooperation with railroads or other companies which place their facilities at the disposal of the Service for the experiments and demonstration. Such projects include the treatment of ties in cooperation with the Chicago, Milwaukee & St. Paul Railroad Co., the application of principles of wood preservation to mining timbers in cooperation with the Anaconda Copper Mining Co., and the installation of 39 sets of test timbers of various kinds, including crossties, piles, poles, paving blocks, and fence posts in cooperation with companies and individuals interested in the problem of wood preservation.

WOOD DISTILLATION.

The wood-distillation studies of the year were confined to problems bearing on the distillation of resinous woods, especially southern yellow pine and Douglas fir. Distillation processes successfully applied to these woods would have great economic importance in the utilization of forest and mill waste. The wood-distillation industry has been placed upon a good business basis in the Southeastern States, and to a lesser extent in the Puget Sound region, where sufficient quantities of cheap wood, such as lightwood, pine knots, etc., are available. The application, however, to the general run of mill and forest waste depends upon the development of apparatus which will greatly cheapen the present cost of production.

Experiments in steam distillation investigated (1) the minimum amount of steam required for the extraction of the volatile oils from yellow pine and Douglas fir, (2) the size of the chips required to

secure the best results, and (3) the relation of the yield of products to the duration of the treatment.

These experiments yielded many significant results. They will be continued to learn how the process may be profitably applied to materials giving much lower yields of products than those now obtained.

Important results were obtained from a study of the subject of refining and grading the crude products of distillation. The commercial success of distillation plants often pivots on the ability of the manufacturer to produce a marketable product. The paint and varnish trades frequently object to wood turpentine, and they are marketed at a great disadvantage as compared with gum turpentine. By refining commercial samples from plants using different processes, including destructive and steam distillation and extraction processes, the results showed that, using a continuous-column still with a capacity of 25 gallons of crude oil per hour, it was possible in every case to obtain a marketable turpentine, and in most cases a product free from objectionable odors. Samples of the turpentine produced were sent to different paint and varnish manufacturers, and were tested by them. The tests showed that in general the greatest difference between gum turpentine and wood turpentine affecting the value of the latter is the odor, but that there is also a difference in the solvent power and drying properties. In some cases the wood turpentine was slightly superior to the gum turpentine with which they were compared, and in other cases not quite as good. To demonstrate the commercial practicability of the apparatus, the experimental still was set up at the plant of the Atlantic Turpentine Co., at Mount Pleasant, Ga., the cooperating company bearing the entire expense of shipping and installing the apparatus. The results showed conclusively that the still could be readily applied to the refining of wood turpentine on a commercial scale. As a result of this demonstration several distillation plants have decided to install improved apparatus for the refining of their products.

WOOD PULP AND PAPER.

The pulp and paper studies covered the mechanical grinding process, the chemical processes, and the suitability of different woods for both classes of pulp. So far as the immediate needs of the paper trade are concerned, the work with ground pulp is of greater importance. The consumption of news and cheap print papers has increased very rapidly during the past 20 years, and will doubtless continue to increase. Mechanical pulp is produced almost entirely from spruce. Hundreds of millions of dollars have been invested in mills which are depending upon this species for their raw material. On the other hand, the supply of spruce in the United States is rapidly nearing exhaustion, and it seems probable that the future of the mechanical pulp industry in the United States depends upon its ability to find a substitute. For the manufacture of chemical pulp also new raw materials are required.

One serious difficulty in the past in connection with the pulp and paper investigations of the Forest Service has been the lack of means for accurately describing the qualities or properties of a pulp. During the year much progress was made in overcoming this difficulty

through the perfection of laboratory methods and, following this, the establishment of standards for expressing the properties of wood pulps. Previously the results of the experiments could be expressed only by an empirical inspection of the samples of pulp produced, the value of the inspection depending entirely upon the judgment of the inspector. Until this difficulty was overcome it was impossible to record the results of these investigations so as to enable them to carry any assurance of the reliability of the conclusions.

Another difficulty now overcome arose from the absence of adequate apparatus. Congress provided in the sundry civil bill \$30,000 for paper-pulp investigations. With the assistance of the National Pulp & Paper Manufacturers' Association, a laboratory with the most approved types of commercial equipment was installed at Wausau, Wis., about January 1, 1911. Experiments have since been under way. They have already demonstrated the suitability of jack pine and hemlock for pulp. Samples of the pulp have been manufactured into paper under commercial conditions, and it seems very probable that the paper mills of the country may, with their present equipment, operate so as to use both hemlock and jack pine. It is proposed to continue these investigations until it has been conclusively determined what species available in the United States may be used for the production of news and cheap print papers.

Experiments were made to determine the suitability for chemical pulp of jack pine, dead and green tamarack, and other species easily accessible to the pulp mills; and also to establish the relations between different factors entering into the production of wood pulp and the quantity and quality of the pulps produced. A line of investigations of much greater economic importance studied the suitability of different forms of mill and forest waste for the manufacture of chemical fibers. A most excellent grade of Kraft pulp was produced from clean western yellow-pine mill waste. Excellent pulps were also made from southern yellow pine. These studies, however, have not progressed far enough to warrant definite conclusions.

NAVAL STORES INDUSTRY.

The production of turpentine and rosin has always been confined in this country to the longleaf pine belt. The industry has gradually moved southward from the Carolinas to Florida, and westward into Louisiana and Texas, seeking new sources of supply. The ordinary period of operation on the same trees is only three or four years. Unless improved methods are applied or new fields for operations are opened the industry faces an early exhaustion of the timber from which its raw material is derived.

Experiments conducted by the Forest Service have demonstrated conclusively that present methods of chipping are unduly severe on the vitality of the tree, and that by decreasing both the depth and the height of the chip much more gum can be secured, while the period of operating can be extended almost indefinitely; and contracts for turpentering on the Florida National Forest are being carried out with great success under the conservative methods developed by the Service. The results attained indicate that the production of naval stores can be made a part of forest management, and combined with the timber crop rotation in such a way as to provide for a sus-

tained yield both of crude turpentine and of saw timber from the same area. Further, experiments made during the year with western yellow-pine timber on National Forests in Arizona, southern Colorado, and California promise to open a vast new field of supply. It was found that during the productive season about the same yield of crude turpentine is obtainable from western yellow pine as from average stands of longleaf pine; the productive season, however, is much shorter in the West than in the South. Similar experiments, but on a smaller scale, were made with sugar pine, lodgepole pine, digger pine, and piñon. This work was supplemented by an exhaustive study of turpentines secured under different conditions, to determine to what extent the properties of gum turpentine may vary.

WOOD UTILIZATION

An important line of work is the compilation of data for a series of publications on the properties and uses of commercial woods, each species being separately considered. The first of the series, "Cedars, Cypressess, and Sequoias," was published during the year. The completed series will include not only all the well-known commercial woods, but a number of others which are just coming into use, or whose properties fit them for use.

For a number of years the supply of southern juniper, or red cedar, has been growing scarce, until old fence rails and the floors and joists of old cabins in Southern States have been bought up for pencil wood. In cooperation with some of the leading pencil manufacturers the Forest Service has been making an effort to find substitutes. Special attention was directed toward species found in the National Forests. The woods tried were Rocky Mountain red cedar, western red cedar, western white pine, alligator juniper, one-seed juniper, redwood, bigtree, incense cedar, yellow cedar, Port Orford cedar, and western juniper. None of the woods appear to be equal to red cedar, but some are satisfactory, at least for second-class pencils.

Other studies of new uses of woods conducted during the year include practical tests of various species as substitutes for dogwood and persimmon in the manufacture of shuttles, tests of incense cedar in the manufacture of cigar boxes, and the use of cypress for plug-tobacco boxes.

Special studies of the conditions of utilization of a number of important species was made during the year. In cooperation with the National Hickory Association an investigation was made of the manufacture, marketing, and utilization of hickory. A study of the supply and use of osage orange was conducted with special reference to the requirements of wagon manufacturers. An investigation has been inaugurated to collect data on the use and markets for western red cedar used in the shingle industry.

In connection with the investigations of the by-products of wood the question of the waste at sawmills which might be available for use is important. Studies have already been conducted in Wisconsin to determine the average amount and condition of such waste and its availability for the manufacture of by-products.

The cooperative work between the Forest Service and the Bureau of the Census in collecting and compiling statistics of forest products in the United States was continued during the year. The statistics

cover lumber, lath, shingles, crossties, poles, pulp, tanbark, cooperage, veneers, and wood distillation.

Studies of the wood-using industries of various States were completed in Massachusetts, Maryland, North Carolina, Kentucky, Wisconsin, Oregon, Illinois, Louisiana, New Mexico, Arizona, Colorado, Utah, Wyoming, Washington, and Nevada. In a number of cases the reports have been published by the States concerned. Investigations were begun but not completed in Arkansas, Wisconsin, Michigan, Virginia, New Hampshire, and California.

The collection of wholesale lumber prices, f. o. b. market and f. o. b. mill, was continued with the assistance of 5,000 cooperating lumbermen. Early in the year the record of market prices was changed from a monthly to a quarterly basis. This compilation of statistics is expected to serve as a continuous record of prices; to show what the manufacturers of lumber receive for their product at the mill, and what the final cost of lumber is to the retailer and consumer; and, finally, to set forth the important part which freight and selling charges play in the final cost of lumber.

Substitution of other materials for wood is steadily gaining in this country. A summary of answers to inquiries sent by the Forest Service to 3,000 retail lumber dealers in 10 central agricultural States shows that substitution has occurred in certain classes of wood products to the extent indicated by the percentages following: Finish, 0.9; sheathing, 2.4; lath, 3; fence posts, 3.7; siding, 4.1; common lumber, 5.3; dimension stuff, 5.4; flooring, 6; pickets, 9; fencing, 13.7; shingles, 16.2; average, 5.4. These changes have occurred in the last three years. Iron and cement are the chief substitutes. The study of this subject is not yet complete.

MISCELLANEOUS.

Nine hundred and fifty books and pamphlets, obtained either through the department library (of which the Forest Service library is a branch) or by gifts or exchange, were added to the working library maintained in the Washington office, making a total of 14,963. By far the greater number of new books were free publications. The library receives regularly 60 forest and trade journals.

There are now small field libraries in the supervisors' offices, the district offices, the forest experiment stations, the Forest Products Laboratory, and the Office of Wood Utilization at Chicago. The district libraries average about 750 books each and the supervisors' about 88. To these field libraries there were sent out during the year 3,676 publications, of which the majority were free publications, either Government or State. The amount spent for the purchase of books for the field during the year was \$2,000.

There are now 25,098 classified and tabulated photographs in the collection, 1,846 of which were added during the year.

Over 200 microsections, covering 150 species of native hardwoods, were added to the collection which is used in the study of the structural characteristics of wood and in the identification of wood samples.

The reference collection of native and foreign woods was augmented during the year by the addition of 460 specimens. The entire collection now includes about 6,000 specimens. Approximately 3,000 forest-tree specimens were added to the forest herbarium,

which now contains 5,000 reference specimens, and over 10,000 tree-range records were added to those on file. There are now plated 525 maps showing the distribution of trees by species.

During the year the Forest Service issued 31 new publications, as against 27 the year before. The total number of Forest Service publications distributed was about 245,500, as compared with 406,000 in the previous year. During the past two years the Forest Service has greatly increased the number of its bulletins of a technical character, which are meant particularly for the advancement of scientific work.

There were 185 public addresses delivered during the year, usually in response to direct requests from organizations interested in technical forestry, from associations of lumbermen or lumber manufacturers, or from educational bodies or institutions. Exhibits were made at nine expositions, and four of them were supplemented, at the request of the exposition management, by a series of explanatory lectures. The expositions in which the Service participated were: The Appalachian Exposition, Knoxville, Tenn.; the National Corn Exposition, Pittsburgh, Pa.; Kansas State Fair, Hutchinson, Kans.; United States Land and Irrigation Exposition, Chicago, Ill.; Land and Irrigation Exposition, Worcester, Mass.; the Alabama Industrial and Agricultural Exposition, Montgomery, Ala.; Arkansas State Fair, Hot Springs, Ark.; and the International Exposition, Turin, Italy. All expenses for the transportation and installation of material and for travel and subsistence involved in making these exhibits and sending speakers were borne by the exposition authorities or privately contributed, except in the case of the Turin exposition, for which a congressional appropriation had been made. The material used was that on hand as a result either of work done for previous expositions or of the regular laboratory and collection work of the Service. In general, acceptance of requests for public addresses is made conditional on the payment of all expenses involved.

WORK FOR THE ENSUING YEAR.

In the foregoing report reference has been made to many investigations and experiments which were in progress at the close of the fiscal year. Some of these are of such a character that the information sought can be ascertained or the object accomplished within a comparatively short time. In such cases the work will be completed and terminated as rapidly as possible. In many cases, however, the work planned is so comprehensive in character that it must necessarily extend over a considerable period of time. In general, the work for the ensuing year will be along the same lines as that described for the past year. Detailed enumeration of all the investigations under way or planned would so largely traverse ground already covered that specific mention of most of them will not be made.

The work of bringing about changes in Forest boundaries for which the field investigations were begun in 1908 will be brought to completion. There are still 39 proclamations to be issued before the results of these investigations will have culminated in accordance with the policy outlined in the body of this report. The field work has been completed for nearly all the Forests still remaining, and the reports have been considered and final conclusions reached. The

proclamations putting the changes into effect will be issued in the course of the next few months.

The study of the business side of National Forest management will be continued on certain typical Forests to increase the effectiveness of the field force by cutting out lost motion and misdirected effort. It is true that the organization can not be operated precisely along the lines of a private enterprise having a strictly commercial purpose, but the proper output or the desired results in National Forest management are not wholly intangible. They include protection of the Forests, increase in their productiveness, and proper use of their resources. It can at least be determined on each Forest what is the cost of the work done and what results are produced, whether that cost is excessive, and whether the output in work or results can not be increased.

The better preparation of the rangers for their work will continue to be encouraged, both by regular courses of winter study and by the continuance of rangers' and supervisors' meetings. As the results of the work are shown by the increased effectiveness of the men, it is believed that a stimulus will be applied in the form of a steadily rising standard of qualifications necessary for forest officers. In this connection mention may be made of the very valuable work which is being done by several universities and agricultural colleges in the West, which give short ranger courses each winter. A considerable number of National Forest rangers go on furlough in order to attend these courses each year, and the Forest Service finds it well worth while to permit them to do this and to cooperate with the institutions offering the courses by sending lecturers who deal with questions of technical administration. One beneficial effect of these schools is to provide the means, which nowhere existed previously, for the training of prospective rangers.

The principal effort in connection with sales of National Forest timber will be to secure the disposal of as large a quantity as possible of the fire-killed timber still unsold. This effort will be combined with the encouragement of large sales under long-term contracts in localities where inaccessible bodies of mature timber exist for which there is no local demand and whose removal will be beneficial to the Forests. The specific objects of this policy will be to improve the Forests by the removal of deteriorating material, putting them in better condition for future production, and to increase receipts to a point which will place the Forests upon a self-supporting basis.

The systematization of the management of the respective Forests based upon working plans in which all of the data secured by the Service is assembled in ready form for administrative use will be particularly emphasized. Another important feature will be the standardization of methods of cutting in similar forest types throughout various portions of the West, in the light of careful study of the results obtained in all of the sales made up to the present time.

In continuing reforestation work an effort will be made to cover approximately 30,000 acres annually, but by periods of years rather than in individual years, the work in any one year being concentrated upon the various processes of seed collection, seeding, and the like, in accordance with the most economical and effective organization. Intensive experiments will be continued in direct seeding, nursery practice, and field planting, and with valuable exotics in restricted

localities to which they are particularly adapted in order to further build up the much-needed knowledge of methods necessary to the effective prosecution of this work.

The most significant feature of the investigative work will be the extension of the system of local experiment stations to include additional forest types and regions. Since the termination of the fiscal year such a station has been established in the exceedingly valuable belt of white-pine timber in northern Idaho. During the next year at least one additional station will be established, probably in the northern Sierra Nevada Mountains of California. Further stations are under consideration in Utah or southern Idaho and on the west slope of the Cascade Mountains in Oregon or Washington, and will be developed as soon as local administrative conditions make them practicable. The development of a chain of stations of this character for conducting intensive experiments in the various forest regions of the country will be of the greatest value in reducing our knowledge of silviculture to a more exact basis and will bring a greater return for the cost than any other investment which could be made in investigative work.

In grazing studies the grazing reconnoissance of different Forests will receive the greatest attention, and the energies of the majority of the technical men will be concentrated on this class of work. It is of principal importance, because it will establish a definite basis for all future scientific investigations connected with the grazing of live stock upon the Forest lands. While the number of technically trained men available for this class of investigations is not adequate to meet the demands being made by the different districts, it will be possible to complete reconnoissance examinations of several of the most important and typical Forests, and so to train the rangers assigned to the work that independent examinations by local forest officers will materially supplement those by the men regularly assigned to the work. While the grazing and lambing pasture experiments upon the Wallowa and Cochetopa Forests will be continued, they will only receive the attention necessary to secure accurate data showing the results secured by the permittees using them, there being no further need for detailed and continuous observations throughout the season. Continued attention will be given to the natural and artificial seeding of depleted ranges, the natural regeneration of certain important types of forage grasses, the study of the effect of grazing upon forest reproduction, and the study of the effect of soil acidity upon various species of important forage plants.

In order to coordinate the investigative work conducted throughout the Service and insure the thorough consideration of all plans of work before it is undertaken, a central investigative committee will be organized in the Washington office, consisting of the most proficient members of the Service in this line of work, whose function will be to exercise general direction and control of the various investigative projects of all kinds in the interest of thoroughness, proper correlation, and the avoidance of duplication. The central committee will be supplemented by field committees in each district exercising similar duties within the district. A series of publications dealing with the progress made in the various investigative projects, current data obtained at experiment stations, and the results of minor pieces

of investigative work which do not merit separate publication will be issued as a means of stimulating interest in this branch of the work of the Service and of keeping the investigators in touch with one another's work.

The series of sample plots on areas cut over under timber sales will be extended as a means of conducting a continuous and comprehensive study of the results of various methods of cutting on reproduction, production of wood, and general forest conditions.

Cooperation with the States in fire protection will in all probability be materially extended. The most important feature of this work will be close study of the actual protective systems put in effect by the various States, both as a means of insuring efficiency in the results obtained from Federal assistance and to standardize and unify as far as may be desirable the protective systems adopted by the various States. The investigation of forest conditions in States desiring to cooperate with the Government in this work and the compilation of State forest laws will be continued.

The most important work confronting the Forest Service in furtherance of a more general and better application of forestry in the East is the standardization of silvicultural systems applicable to the principal forest types. The data already secured will make it possible to do this with little additional field work. A series of publications covering specific areas, by States or portions of States, and containing the standard silvicultural methods for the various types as developed by the best experience and information, will go far toward making expert information available without cost to the great mass of private owners in the Eastern States.

REPORT OF THE CHEMIST.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF CHEMISTRY,
Washington, D. C., September 1, 1911.

SIR: I have the honor to transmit herewith the annual report of the Bureau of Chemistry for the year ending June 30, 1911, together with the plans for the work proposed for the next fiscal year.

Respectfully,

H. W. WILEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

FOOD AND DRUG INSPECTION.

GENERAL NATURE AND VOLUME OF THE INSPECTORS' WORK.

As the initial force in the correction of violations of the food and drugs act of June 30, 1906, the inspectors continued their work of locating and reporting instances of the production and shipment of misbranded or adulterated foods or drugs, and procuring samples of the same for examination. References of this nature, when confirmed by the necessary examinations and analyses, form the bases of punitive actions directed against the persons, firms, or corporations who may be responsible for the violations, or cause the institution of libel actions against the commodities at fault. The department submitted 312 of the latter cases to the appropriate United States district attorneys, who caused the issuance of summary orders by the proper courts to restrain traffic in the goods. After due trial some of these goods were destroyed and others returned to the claimants upon the submission of satisfactory evidence that they would not be disposed of contrary to law. The scope of inspection work as far as libel actions are concerned was very materially enlarged by a decision of the Supreme Court within the past year. It was held that an interstate shipment made in violation of the law was subject to seizure as long as the product remained in the original, unbroken package, regardless of the extent to which the shipment had entered the commerce of the State by means of intrastate sales subsequent to its delivery to the original interstate consignee.

The number of official samples collected during the past fiscal year was approximately 9,500. These were representative of products which had actually been shipped into interstate commerce for distribution to the consuming public and were subjected to examination for

purity and grade. Although there has been a great improvement in the character of foods and drugs now being manufactured and sold, as well as in the representations made concerning them, the number of prosecutions concluded during this year was greater than ever, and resulted in the inspectors devoting much time to attendance at trials and in securing needed evidence at the request of prosecuting attorneys; this, of course, affected the volume of routine inspection work. In addition to the samples mentioned, there were also obtained approximately 2,000 informal samples for the information of the bureau, for scientific research, or to indicate the general character of interstate shipments. The careful inspection of factories was not neglected, and as the location of certain classes of producers becomes better known this branch of the inspection work is being systematized so that more results are obtained with less expenditure of time and effort.

COOPERATION OF INSPECTORS IN SPECIAL INVESTIGATIONS.

WORK CONTINUED FROM THE PREVIOUS YEAR.

SARDINES.—Among the unfinished work of the preceding year was the investigation of the sardine-packing industry, which it was impossible to conclude within the usual season because of the late run of fish. This was continued during the summer and fall of 1910, and a number of reports and specimens were submitted, the examination of which verified the belief that the products were unfit for food purposes either because of age and spoilage or contamination with tin. A number of seizures of such goods was made, the last and most important of these consisting of 8 carloads of sardines which were seized before the consignee, a packing firm, had an opportunity to process them. In this case the goods were in such an advanced stage of decomposition as to constitute an adulteration. The inspectors were aided in this investigation by a number of firms and individuals connected with the trade, who were desirous of checking certain undesirable practices which had begun to invade the industry.

BLEACHED FLOUR.—The collection of official samples of flour which had been bleached with nitrogen peroxid was also continued, for repeated investigations proved that a number of mills were continuing to ship interstate consignments of such products in the face of adverse decisions by the courts. The data thus obtained was used in sustaining the department's position in the bleached-flour appeal case which was argued in the spring of 1911, following the decision in Kansas City in July, 1910.

EGG PRODUCTS AND VINEGARS.—In spite of the many actions brought against shipments of egg products which were unfit for food purposes because of filthiness, putridity, or decomposition, traffic in such inferior articles of food did not seem to abate, as a résumé of the inspection work shows that a far greater number of samples of such adulterated eggs were collected and more seizures made during this period than in the preceding year. Vinegar is another substance which continued to be the subject of sophistication, and a great many instances of adulteration have been reported, the chief form of which is the admixture of inferior vinegar with cider vinegar, and the subsequent misbranding of the compounds as apple or cider vinegar.

CITRUS FRUITS.—The investigation concerning the shipment of immature citrus fruits, begun several years ago, was again taken up at the proper season, and the collection of samples and of necessary information was continued over such a length of time as to enable the bureau to establish beyond a doubt that the interstate traffic in unripe fruit of this character, which was subsequently treated to increase the color in the peel in order to simulate full development and mature fruit, was an illegal practice. The conclusion of this investigation was followed by the issuance of Food Inspection Decision 133, giving the opinion of the department in this matter, especially as it relates to oranges.

MILK INSPECTION.—The intrusion of other work operated against the massing of a large force of inspectors at any one point, such as has been customary in conducting milk campaigns in the past, but this did not prevent a scrutiny of the milk products furnished to a number of cities throughout the country. The collection of samples in these instances was undertaken by a fewer number of inspectors who were favorably situated at locations affording strategic advantages. It is worthy of note that these collections showed that the adulteration of such valuable food substances as milk and cream is less prevalent than formerly.

NEW INVESTIGATIONS.

When the examination of a great many samples of a given line of products indicates that there are but few instances of violations, further collection is discontinued and attention is given to a new class of material. This policy caused the abandonment of some of the former subjects of investigation and the substitution in their stead of other inquiries, several of which are especially noteworthy. Simultaneous investigation was made during the fall of 1910, in a number of localities, of the tomato-canning industry. This inquiry developed that it had been a practice for factories to utilize tomato refuse in preparing soup stocks and pastes, and as this material was permitted to remain unprocessed for considerable lengths of time, under conditions which were often the reverse of sanitary, it was plain that the finished products could not be free from evidences of spoilage and bacterial contamination. As the analyses substantiated and confirmed the findings of the inspectors relative to the filthy condition of such articles, prompt steps were taken to suppress traffic in such goods, and a great many seizure actions were submitted by the department to the Department of Justice for appropriate proceeding.

The investigation of the presence of arsenic in food materials had progressed far enough to indicate that this deleterious substance was found only too frequently, and a great many official samples have been collected of baking powders and baking-powder materials, colors, and shellac and other coating materials used in the manufacture of confectionery. A large number of these contained arsenic in prohibited amounts and led to the institution of many libel recommendations. The collection of specimens of cheap confectionery during the holiday seasons, such as Christmas and Easter, revealed the too prevalent use of coloring agents and filling materials of questionable value.

The former practice of improperly branding as "Mocha" or "Java" coffees grown elsewhere than in Arabia or the Dutch East Indies has

been practically abandoned as far as interstate shipments are concerned, but a different form of sophistication was revealed in the manipulation or sweating of inferior grades of coffee to improve the appearance and to enable the sale at increased prices under false designations. Since the seizure of one shipment of this processed coffee no further violations of this sort have been reported. Greater attention was also paid to the manufacture of the various forms of prepared and dried mustard, as quite large quantities of charlock or wild mustard are known to be used, and endeavor was made to prevent the substitutions of this for pure mustard without proper declaration on the label.

Considerable attention has been given also to the spurious champagnes or champagne ciders which masquerade under the guise of genuine bottle-fermented wines. The inspectors continue to maintain vigilant supervision over bulk goods which may be misbranded as to weight or capacity; the chief commodities which are thus misbranded have been found to be vinegar, cheese, meal, and stock feeds. Since the passage of the insecticide and fungicide act the inspectors have also been charged with the collection of official samples of such commodities which have been shipped into interstate commerce subsequent to January 1, 1911.

COOPERATION IN SCIENTIFIC STUDIES.

The scientific branches of the bureau have continued to request that inspectors take up special subjects for investigation, and as instances of this sort there may be mentioned the following: The investigation of the production of infant and invalid foods, at the request of the animal physiological laboratory; the collection of authentic samples of animal and vegetable oils, together with reports on the attending processes of manufacture, for the information of the fat, oils, and wax laboratory; inspection of breweries for the purpose of making a closer study of the manufacture of beers and other fermented liquors; an extended investigation of the molasses industry, with particular reference to the moisture content in molasses, and the continued collection of authentic samples and the investigation of the manufacture of maple products, for the information of the sugar laboratory; inspection of the sources of spring waters and collection of samples, at the request of the water laboratory; and the investigation of pseudo cod-liver oil preparations at the request of the drug division.

DRUG INSPECTION.

The inspection of factories producing drug products and the supervision of interstate traffic in the case of such goods was continued. Many samples of patent and proprietary medicines were obtained for examination by the drug division, and, in addition to these, official samples were also collected of a number of pharmaceuticals which are recognized by the United States Pharmacopœia and the National Formulary. Such goods are not offered to the consuming public directly, as is the case with patent medicines, but they are manufactured for dispensing upon physicians' prescriptions, and the necessity for such articles conforming to the prescribed standards of purity and

strength is greater even than in the case of other substances whose sophistication would prove no more serious than perpetrating a fraud upon the purchaser. Several instances of violations of the law were developed in the case of adulterated crude drugs, not indigenous to this country, which were imported through ports not having laboratory inspection, and thus escaping the examination which is always made at laboratory ports. In addition to these, there were also obtained official samples of many varieties of native as well as imported crude drugs, which were forwarded to the drug division for examination.

WORK OF THE INSPECTION LABORATORIES.

Samples of interstate foods and drugs taken by the inspectors and samples of imported foods taken at the ports of entry are referred for analysis and report to the appropriate laboratory in Washington or to one of the 21 branch laboratories in other cities. The reports of the branch laboratories on these samples are referred to the appropriate laboratory in Washington for filing, and in case of those samples believed to be in violation of the law for the preparation of the proper information for the Solicitor's Office. The offices of the Bureau of Chemistry in Washington charged in this manner with the preparation of cases are: The Washington food inspection laboratory and the laboratory of food technology of the division of foods, the Washington drug inspection laboratory of the division of drugs, the water laboratory and the cattle food and grain laboratory of the miscellaneous division, and the dairy laboratory. In addition to this other laboratories and divisions make both original and check analyses of samples, but report their results to one of the laboratories mentioned above for the preparation of the case for the Solicitor. In this class may be mentioned especially the sugar laboratory and the microchemical and bacteriological laboratories, whose cases are prepared by the Washington food inspection laboratory, and the leather and paper laboratory, which examines samples of turpentine and reports its results to the division of drugs.

WASHINGTON DRUG INSPECTION LABORATORY.

During the past year the Washington drug inspection laboratory has examined 752 samples as follows: Eighty check analyses of imported drugs, 60 check analyses of domestic drugs, and 73 import products coming directly under this laboratory, the remainder, 529 samples, being domestic products; 231 of the latter were found to be either adulterated or misbranded or both, and 421 cases of interstate drugs judged to be adulterated or misbranded were prepared in this laboratory and reported to the chief of the bureau for transmission to the Solicitor. Two hundred and seventy-five cases on imported drugs, referred from the port laboratories for action, were prepared for the Board of Food and Drug Inspection, 248 of which were found to be contrary to law and 27 were released without prejudice. A number of consignments of domestic drugs have been recommended for seizure on the ground of being misbranded or adulterated or both.

DOMESTIC DRUGS.

The violations were found to be very similar to those encountered in previous years, namely, misrepresentation on the labels of bottles, cartons, and in advertising literature accompanying packages, and the absence of any statement regarding the presence of prescribed drugs, opium, morphin, codein, cocain, alcohol, ether, chloroform, etc., or the incorrect declarations of the same.

A number of the United States pharmacopœial products have been found below the requirements; that is, either deficient in alkaloidal strength, containing foreign material, or entirely spurious. Notices of judgment have been issued in connection with certain pharmacopœial drugs based upon such findings, as follows: *Belladonna* root containing ground olive pits, henbane adulterated with *Hyoscyamus muticus*, powdered gentian containing foreign material, powdered cloves adulterated with clove stalks, and colocynth (powdered) containing a large amount of the seed, specifically excluded by the Pharmacopœia.

Examination of a number of bitters of the Fernet type revealed the fact that they were of domestic origin, containing methyl alcohol, and therefore spurious imitations of products imported into this country.

The attendance of analysts in court cases has consumed much time in the last year.

IMPORTED PRODUCTS.

All cases of drug products detained at the port laboratories for which no precedent has been established are referred to the Washington drug inspection laboratory for check analysis and action, as are also all appeals in connection with imported drugs.

The quality of crude drugs continues to improve, but experience shows that it is necessary to maintain strict inspection. For example, shipments of inferior goods may be denied entry at one or more ports and subsequently consignments of a similar character, if not the rejected material, will be offered for entry at a port where it would not ordinarily be expected.

The violations met with in imported products are more or less similar to those cases noted in connection with domestic drugs; that is, misrepresentations upon the labels, cartons, and in the accompanying literature, and the absence of declarations or incorrect declarations of the proscribed ingredients.

Certain shortcomings were found in shipments of such products as cubebs, containing an excess of stems, immature and inferior berries; buchu leaves containing a large excess of stems; uva ursi, inferior in quality and contaminated with a large excess of stems; digitalis, poor quality and unfit for medicinal use; sarsaparilla root, mixed with a large proportion of rhizomes, which is the portion the United States Pharmacopœia specifically states should be excluded; gum tragacanth, of inferior quality, very low grade, and adulterated with Indian gum. Many importations of asafetida have been permitted entry in harmony with Treasury Decision 31097, which provides that under certain conditions asafetida may be allowed entry in case the

product contains 35 per cent or more of alcohol-soluble material. A number of shipments of asafetida have been found to comply with the United States Pharmacopœial standard for alcohol-soluble material.

The question of bitters has been given considerable attention. It is found that a number of these products are named after certain drugs, or statements are made on the labels which represent the articles to contain a substantial quantity of a given ingredient or ingredients, while the analyses often reveal at most only a trace of the specific drug referred to by name or by representations. Cinchona and quinin preparations are typical of this class of products. A number of consignments have been offered for entry under the name of magnesia or terms including the word "magnesia," which were found upon examination to contain only a small amount of this body, the product depending for its activity on organic acids (principally tartaric) and the sodium bicarbonate present.

The number of shipments of Chinese opium and morphin pills referred to in last year's report have materially decreased, but those shipments offered for entry are regularly detained as being in violation of section 11 of the food and drugs act in that they may be dangerous to the health of the people of the United States.

A number of importations of products containing opium, morphin, and codein have been detained as being in violation of section 11. The basis for such action was that the goods were prepared in the form of a confection, flavored in such a way as to be attractive to the taste, and recommended and presumably used as household remedies for colds, coughs, etc., but as a matter of fact some are sold as ordinary confections. The danger of such preparations is at once apparent. Certain dangerous habit-forming drugs have been eliminated from some commodities of this type during the past year.

WASHINGTON FOOD INSPECTION LABORATORY.

The Washington food inspection laboratory is charged with the analysis of the original samples sent to it for examination and with receiving the reports and arranging for or making check analysis of samples examined in the branch laboratories of all classes of foods not otherwise provided for in one of the specialized laboratories of the bureau. The total number of samples examined during the year was 3,164, of which 945 were check samples of imported foods taken at the various port laboratories. In addition to these there were 152 imported food samples taken in connection with the nonlaboratory port inspection in the Washington district, and of the total 2,067 were samples of food of domestic origin. These figures include the imported and interstate samples referred to the sugar, microchemical, and bacteriological laboratories for examination, many of which were examined in several of these laboratories and are there reported. The preparation of cases arising from these examinations forms a large part of the work of this laboratory, 2,142 having been prepared during the year. In addition to these, the food technology laboratory, although devoting its time chiefly to constructive investigation, examined 108 initial and check samples and prepared 185 cases on

extracts and essential oils originating in this or in a branch laboratory. The cases prepared by the dairy laboratory and the miscellaneous division are recorded in connection with those investigations (pp. 433, 453, and 455).

A large percentage of the domestic samples found by the branch laboratories to be adulterated or misbranded are checked by the Washington inspection laboratory, this forming its chief duty. The volume of this work, both analytical and executive, restricts to a great extent investigation, although a certain amount of research work is done in connection with special problems arising directly in connection with the law, as, for example, the investigations of cider vinegar, maraschino, noodles, beers, etc. (See pp. 440 to 444.)

All import cases not decided upon established precedents at the port laboratories and reported direct to the collector of customs are referred to this laboratory, checked, if necessary, and the case prepared for reference to the Board of Food and Drug Inspection. Seven hundred and thirty-one cases were so handled during the past year, constituting approximately one-third of the shipments detained, and of these 553 were found to be illegal and 178 were released without prejudice to future decisions. This work often necessitates investigations of manufacturing conditions, composition of foreign products and their natural variations, trade practices, etc.

WORK OF THE BRANCH LABORATORIES.

GENERAL TABULAR STATEMENT.

The following tabular statement indicates the volume and scope of the work done at the port laboratories. The varying conditions at the several ports, the different amounts of time given to court and research work, and the fact that some laboratories have a much larger force than others, makes any comparison misleading. Furthermore, at some ports chemists have been assigned to special inquiries or transferred to other laboratories to meet certain exigencies, as at Pittsburgh, Galveston, and Nashville. The main investigations inaugurated at the Washington office relating to vinegar, beers, egg noodles, and the deterioration of fruit and vegetable products such as ketchups, jams, etc., including the examination of the fresh products and the same at various stages of decomposition, were participated in by nearly all of the port laboratories and no special mention is made of them under the individual reports. Another line of work which is pursued at all of the laboratories to a greater or less degree is the cooperation with local branches of the departmental service, notably the commissary officers of the War and Navy Departments, the collectors of customs, and the collectors of internal revenue, for whom samples are examined and much time saved, especially for those located on the Pacific coast and at other points distant from Washington.

Food and drug samples examined in the various branch laboratories during the fiscal year ended June 30, 1911.

Laboratory.	Imported samples.				Interstate samples.			Miscellaneous samples.	Total samples analyzed.	Hearings.	
	Legal.	Illegal.	Released without prejudice.	Floor inspection samples.	Legal.	Illegal.	Check analysis.			Personal.	By correspondence.
Boston.....	140	232	348	9,025	36	144	40	97	1,037	317	146
Buffalo.....	89	35	7	122	259	240	6	9	645	38	64
Chicago.....	181	146	12	2,708	619	512	71	81	1,622	214	139
Cincinnati.....	201	25		393	110	76	38	22	472	254	129
Denver.....	60	18	3	21	125	139	10	73	428	8	80
Detroit.....	38	19	13	246	60	80	12	53	275	15	209
Galveston.....	32	3	3	179	156	81	2	49	326	1	73
Kansas City.....	5			4	265	86	13	32	401	53	75
Nashville.....	14	4	5		258	94	10	29	414	18	76
New Orleans.....	121	54	22	3,262	89	102	9	58	455	93	54
New York.....	2,722	1,766	682	49,643	311	530	134	365	6,510	1,257	627
Omaha.....					198	129	1	29	357	37	38
Philadelphia.....	548	142	75	5,986	18	43	22	37	885	223	107
Pittsburg.....	24	26	1	100	92	137	29	48	357	49	78
Portland.....	152	81	35	4,433	116	126	6	95	611	76	30
St. Louis.....	14	9		153	198	298	28	51	593	108	60
St. Paul.....	57	19	3	222	71	62	8	30	250	35	31
San Francisco.....	281	193	17	16,309	219	155	57	66	988	117	83
Savannah.....	454	202	18	120	42	55		10	781	20	204
Seattle.....	212	111	24	3,203	38	24	7	172	588	88	46
Total.....	5,345	3,085	1,268	96,129	3,280	3,113	503	1,406	18,000	3,021	2,349

BOSTON LABORATORY.

The work at the Boston laboratory was, as usual, about equally divided between import and interstate samples. The following special investigations have been continued or undertaken during the year:

FISH.—Work to detect, chemically, slight decomposition taking place in fish was continued from last year. This has been confined primarily to the sardines of the Maine coast, which, when caught filled with "red feed," a small crustacean, decompose very rapidly, and in a few hours, under usual conditions, are unfit for packing. The corrosion of unprotected tin containers by sardines in mustard sauce, as shown by periodical examinations of a lot packed under the supervision of the laboratory, showed that after processing the contents of the cans of the size known as eighths, contained about 200 mg of tin per kilo, which amount rapidly increased during four months' storage, at the end of which time about 800 mg per kilo were present. The packers have now generally adopted lacquered tins for these goods.

ARSENIC IN SHELLAC USED IN CONNECTION WITH FOOD.—An investigation was made of the content of arsenic in shellac of all kinds, but particularly in such brands as are used by confectioners for coating candy and by brewers as a varnish for their vats and other receptacles. Early in the year a confectioner's shellac was examined which contained 0.2 per cent of arsenic. This led to a study of such shellacs, and all examined were found to contain more or less arsenic, which is added in India in the form of the yellow sulphid to improve the color of the product, enabling an inferior product to be sold as a

superior one. Twenty-eight samples of shellac of various kinds purchased on the market contained an average of 526 mg of arsenic as arsenious oxid per kilo.

TALC ON CONFECTIONERY.—In connection with the work on shellac used for confectionery it was ascertained that there existed a practice of coating confectionery, such as Easter eggs, marbles, jelly beans, etc., with talc, though the use of talc in confectionery is expressly prohibited by the food and drugs act. The extent of the use of talc in this way was investigated and as a result its use has been practically abandoned, at least in so far as New England is concerned.

HOPS.—The antiseptic effect of hops has been investigated, the several samples examined of domestic and imported hops of different kinds showing that hops possess such a property in a varying degree.

CHICAGO LABORATORY.

The following investigations have been continued, and, as far as practicable, brought to conclusion during the present year:

(1) The composition of vanilla extracts prepared in the laboratory according to the United States Pharmacopœia from different kinds, grades, and lengths of beans.

(2) The composition of vanilla extracts prepared in the laboratory from typical kinds of beans following different methods of extraction.

(3) The effects of aging and bleaching on the composition and physical characters of flour.

The methods used in these investigations have, for the most part, been devised or developed at this laboratory. A method for determining the gasoline color value of flour and certain improvements in the process of determining vanillin, coumarin, and the lead number of extracts were elaborated. More recently special attention has been devoted to the determination of the color value of the lead acetate filtrate of vanilla extract as compared with that of the extract itself to obtain data of service in detecting foreign coloring matter. The quarters occupied for four years in the Manhattan Building having proved entirely inadequate, new rooms, covering about 3,000 square feet, have been secured and specially equipped in the Heisen Building, at the corner of Dearborn and Harrison streets.

NEW YORK LABORATORY.

IMPORTED FOODS.—The New York laboratory is chiefly concerned with the inspection of imported food and drug products. During the past fiscal year about 100,000 invoices of food and drug products have been inspected, representing a total value of merchandise of \$180,000,000.

Of the various lines of food products which have been inspected during this period, particular attention has been given to figs and ripe olives. During the late fall and winter months large and numerous shipments of figs and ripe olives arrive from the Mediterranean ports. Examination of these products revealed the fact that in many instances they were unfit for food, for the reason that the fruit was infested with worms or contaminated with their excreta, or fermented, moldy, and decayed. The presence of so many of the

worm-eaten and decayed olives in the shipments inspected was attributed to the practice of gathering and packing culls and windfalls, while the wormy, decayed condition of the figs was undoubtedly due to the methods used in preparation and packing. A noticeable improvement in the quality of the late shipments resulted, evidencing the exercise of more care in the selection of the fruit and the methods of gathering and packing.

During the past year a large number of samples of canned vegetables and fish have been examined for the presence of tin. Notable amounts of the salts of this metal were often found mixed with the contents, the same having been dissolved from the surface of the container. This work involved the selection of a method for the determination of tin which would be both expeditious and accurate, the procedures in common use being found lacking in both these respects.

In connection with the inspection of paprika and ground red pepper the study and detection of the adulterants commonly used has been continued. The refractive index of the nonvolatile ether extract of a large number of samples has been determined. The results indicated that when the conditions of drying the extract are properly controlled the refractive index as well as the iodine number will furnish evidence in the detection of added oil. As a result of collaboration of several chemists with the associate referee on spices, a provisional method for the detection of added oil in paprika was adopted in 1910 by the Association of Official Agricultural Chemists. In preparing the better grades of paprika only the shells and part of the seeds are used, the stems and placenta being removed. In order to utilize these by-products they are sometimes added to the cheaper grades, and as the addition of extra stems unquestionably injures the quality of the finished product it has been the practice to subject samples to careful microscopical examination in order to detect this sophistication.

The question of loss by evaporation on shipments of cloves entering into interstate commerce having arisen, certain experiments were undertaken by this laboratory upon the cloves as imported to determine the per cent and nature of this loss. Representative samples of cloves as imported were secured, put up in wooden boxes holding from 1 to 4 pounds, and allowed to stand under conditions similar to those followed by the spice grinders and spice trade, and the loss in weight determined after standing varying periods of time. Chemical analyses of the samples were also made for further information in determining the character of this loss.

In connection with the inspection of spices a large number of determinations of the ash of various varieties of black pepper and cayennes were made to ascertain the variations as to the normal ash content of these products.

COLORS.—The enforcement of the provisions of Food Inspection Decisions Nos. 76 and 77 has entailed a large amount of original work, both as regards the analysis of dyes offered for certification and the identification of colors found in foods. During the year improved methods of estimating Orange II in Orange I have been elaborated and methods for the quantitative separation of the seven permitted dyes as they occur in certified mixtures have been worked out. A scheme for the identification and separation of the oil-soluble colors has also

been originated. Many of these methods will appear in a report on coal tar colors, now in press.

CIDER VINEGARS.—The study of cider vinegar has been continued, one member of the laboratory having spent a considerable portion of the past fiscal year in the factories of New Jersey, Massachusetts, and New York. A large number of analyses of genuine cider vinegars and of vinegars manufactured from dried waste and from second pressings have been made and the data is being put in proper form for use in connection with the interpretation of results of analyses of commercial samples.

COFFEE.—The matter of the artificial sweating of coffee, which is sometimes practiced in the trade for the purpose of making the South American and other coffees imitate in color and appearance the Java coffee, has been the subject of much study during the past year. Both chemical and microscopical methods for the detection of this sophistication have been investigated to a considerable extent. These studies will be continued.

DRUG WORK.—Continued improvement in the crude drugs is shown. Only a small number of instances of entire substitution of foreign or inferior products is reported. In the case of certain leaves, such as buchu, uva-ursi, cubebs, senna, etc., the occurrence of excessive amounts of stems or twigs has raised a question as to the maximum amount of these substances that should be permitted, and as a general rule 10 per cent has been adopted as a temporary limit. This may be regarded as too liberal by many, but it was the opinion that at present trade conditions did not warrant a more severe limit, for the reason that the admixture has been very high, in some instances as much as 50 per cent, and it is necessary to give the trade some time to correct the methods of collection. Certain importers have arranged to remove the excessive portion of stems from the leaves, and shipments have been permitted entry on condition that this be done, the goods being again examined after the stems have been separated. During the past year buchu leaves have been scarce, due to the failure of the crop, and this has resulted in the presentation for entry of many lots of inferior quality as well as large quantities of long buchu, both of which have often contained large amounts of stems.

ERGOT.—Failure of the supply of ergot both from Spain and Russia has led to the shipment of very inferior lots of this product. Many of these are undoubtedly old goods and have been subjected to some process, such as baking, to prevent decay and worms, which treatment rendered the ergot worthless for medicinal purposes.

CUBEBS.—Large quantities of cubebs are continually being imported, the majority of which do not conform to the requirements of the United States Pharmacopœia, since they contain large quantities of sticks, stems, and immature and overripe berries. It is claimed, however, that these are being brought in for distillation purposes, and such shipments are released by the Treasury Department under such conditions as will insure their use for this purpose only. From the analytical figures it appears that immature berries are richer in oil than those that meet the requirements of the United States Pharmacopœia, and are therefore more suitable for distillation purposes. This matter is being further studied.

ASAFETIDA.—During the last year a large number of shipments of asafetida adulterated by the addition of foreign gums such as galbanum, olibanum, and ammoniacum have been presented for entry. This undoubtedly is due to the enforcement of the requirements of the United States Pharmacopœia with reference to the content of alcohol-soluble material. The investigations and studies necessary for the identification of these foreign gums have been made.

ESSENTIAL OILS.—The inspection of the essential oils has been extended during the past year to include all of those recognized in the United States Pharmacopœia, the work heretofore having been confined almost entirely to the orange and lemon oils. No particular investigation as to methods have been conducted, but data as to the composition of the oils presented for entry has been secured as a basis for future investigations.

PITTSBURGH LABORATORY.

The character of the samples examined at the Pittsburgh Laboratory was quite different from those of 1910, and a great deal of work was required for some classes of materials, notably candies. In addition to the regular examination of official samples, investigations of sirups and medicated soft drinks have been made. The applicability of the Rohrig tube to the determination of fat in cocoa and chocolate showed that this tube could be used in the determination of fat in cocoa with a double extraction, but was inapplicable to chocolate. A method for the determination of caramel in vanilla products has been elaborated and promises excellent results; this method is now being thoroughly tested on different kinds of vanilla extracts.

An important part of the work at this laboratory for the preceding year has consisted in the examination of a large number of samples of candies coated with shellac and other resins. Some of the earlier samples of this character examined showed the product to be coated with shellac containing rosin, and in some cases quite an appreciable amount of arsenic. The latter samples of candy show shellac only, which, however, in all cases contains a small amount of arsenic. Some manufacturers stated that they were willing to stop using the shellac provided other manufacturers will do likewise.

OTHER PORTS.

The following laboratories have made special studies of the subjects mentioned:

BUFFALO LABORATORY.—Investigations on the determination of fat, sugar, and cocoa shells in cocoa products were made. Studies were begun of various methods for the determination of fat in dried milks. Some work on the occurrence of sucrose in grape juice and the change on standing in the composition of grape juice to which sucrose had been added was begun. This work on grape juice was undertaken to determine whether added sucrose would become inverted on standing so as to make it difficult to determine upon analysis whether cane sugar had been added at the time of manufacture.

CINCINNATI LABORATORY.—An investigation of the manufacture of so-called maraschino cherries was made the subject of a special report to the bureau; the number of import samples examined was greatly increased, and the range of food products analyzed was extended.

DENVER LABORATORY.—Cooperative work for the elaboration of methods has been done, embracing flavoring extracts, sugar, and sugar products, and vinegar. The value of a new reagent, namely, paraphenylene diamine hydrochloride, for the determination of citral in lemon oil has been experimented with and valuable data obtained. Numerous miscellaneous investigations have been carried on, such as studying different grades of coffee from the same packer in an endeavor to determine if the retail prices were consistent with wholesale values.

KANSAS CITY LABORATORY.—The photographic apparatus, adapted especially for the reproduction of labels, etc., first devised in this laboratory two years ago, was completed. Cooperative work was done on the general investigations outlined by the bureau.

NASHVILLE LABORATORY.—About 23 per cent of the total interstate samples were classified as drugs, and nearly 40 per cent of these were adulterated or misbranded. As these drugs were collected in this southern territory, the results indicate to what extent this part of the country is flooded with such concoctions. The claims were, in many cases, of an extravagant nature and calculated to play upon the imagination of the poorer class of people. This was the first year of import work at Nashville, and 24 samples were examined, of which 4 were found to be adulterated or misbranded. In collaboration with the bureau special investigations were made of the manufacture and composition of a confection in order to learn what effect the application of heat in the manufacture of this candy would have on certain fat values of the finished product. Some work was done on mixtures of coffee and chicory to obtain a method for the determination of the percentage of chicory present, based on the reducing power of pure coffee and mixtures of coffee and chicory.

NEW ORLEANS LABORATORY.—Early in the spring consignments of tomatoes from Habana were detained at this port, being misbranded as "Florida east coast tomatoes," which are considered in this market a better tomato than the Cuban variety. Eggplants marked "N. Y. eggplants" were also detained. The incoming Habana boats were met and the entire cargoes of fruit and vegetables inspected thereafter for about a month. Upon notification to the importers, and through them to the shippers, the practice of misbranding fruit and vegetables was promptly discontinued.

OMAHA LABORATORY.—Research work on methods of analysis has been conducted with special reference to the determination of sugar in chocolate, of benzoic acid in food products, and of the iodine number on chicken fat. During the year a working equipment for bacteriological analysis has been installed to permit of a more complete study of the condition of various food products. During the month of June the working force of this laboratory were engaged in preparing for, and assisting in, the field and laboratory work in connection with

the special egg investigation conducted by the Food Research Laboratory at this point.

ST. LOUIS LABORATORY.—A large number of vanilla extracts of various kinds were made for information in connection with certain vanilla extract cases pending in court, and a special study was made of a commercial egg preservative. An investigation of the changes taking place in apple juice during barrel fermentation into cider vinegar has been begun and the observations will be continued on this sample of vinegar.

SEATTLE LABORATORY.—The examination of imported foods and of various products for other departments of the Government has constituted the bulk of the work of the Seattle laboratory. Special work and investigations included: (1) The study of the distinction between crude and refined sulphur for the local customs officials; (2) a study of so-called near-beers sold in prohibition sections; (3) the preparation of Circular 63, Bureau of Chemistry, on food colors; (4) cooperative work on preservatives and headache mixtures; (5) a report of the opinions of local dealers, etc., regarding certain spices; (6) a report to the quartermaster's office, United States Army, Seattle, on the water in the submarine cable tank at Tacoma, Wash.

ST. PAUL LABORATORY.—A study was made of wheat flour of known origin and definite history for the purpose of securing information leading to the fixing of more definite limits of composition for wheat flour of the various grades. For this purpose, some 66 samples were secured and analyzed, involving about 660 determinations. The flour thus examined was obtained principally from the Southwestern States and manufactured from winter wheat. A large importation of green olives, apparently purchased as second quality, was condemned during the year, wormy olives and those stung by insects constituting the bulk of the shipment.

EXAMINATION OF DAIRY PRODUCTS UNDER THE LAW.

The work of the dairy laboratory, as in previous years, has covered the entire range of dairy products, including other articles closely related thereto, such as malted milks, lactated infant foods, butter colors, ice-cream thickeners or fillers, and other articles of minor importance. The total number of samples examined was 513, of which 320 were official interstate and import samples, the remaining 193 being of miscellaneous origin, and consisting chiefly of evaporated milks examined in the course of an investigation of the manufacture of this product. A classified list of the samples examined is as follows:

Evaporated milks.....	201	Condensed skimmed milks.....	13
Cheese.....	91	Ice creams.....	13
Cream.....	39	Oleomargarins.....	8
Butter.....	32	Ice-cream thickeners.....	5
Malted milks and lactated foods.....	29	Miscellaneous butter colors, butter	
Condensed milks.....	28	flavors, fermented milks, etc.....	9
Fresh milks.....	25		
Dry milks.....	20	Total.....	513

The greater part of the work under the food law during the year was upon evaporated, condensed, and dried milks, malted milks, lactated infant foods, cheese, and butter.

In canned evaporated milks skimming is comparatively rare and the addition of foreign substances almost unknown. The most common fault is that of low concentration—thin milk—but there has been such a difference of opinion as to the degree of concentration properly to be required in an evaporated milk that but few legal actions have been brought on this charge. In one case, however, a large shipment was seized because of low concentration, and the goods condemned by the court.

For the purpose of fixing upon a fair and just requirement in the matter of concentration the bureau in 1909 began an investigation of the manufacture of this product, which lasted until the fall of 1910. In this investigation factories were visited in various parts of the country, the processes of manufacture were observed in detail, and numerous analyses made of the resulting products produced under observed conditions. Opportunity to observe, and to investigate if desired, was freely granted at nearly all the factories visited, always, however, with the understanding and pledge that the details of factory procedure would not be divulged. The data obtained, however, were used as the basis for a decision on the subject, published early in the present year as Food Inspection Decision 131, on the composition of evaporated milk.

Shortage in the weight of canned evaporated milk is uncommon, and when found is usually so small as to be regarded as accidental, due to the faulty working of the filling machine. This view, however, could not be taken in an instance where a shipment of goods was found to contain only 15½ ounces in cans labeled as "20-ounce size."

Condensed milk, both the sweetened and the unsweetened, when designed for sale in bulk is frequently made from skimmed or partly skimmed milk, and there are constant attempts to sell these skimmed products for genuine condensed milk. The use of the term "skimmed" or "partly skimmed" is studiously avoided by some manufacturers. The distasteful term was in one instance replaced on the label by the word "blended," but the goods were seized as misbranded and condemned by the court.

Violations of law in the cheese trade consist nearly always in the sale of skimmed or partly skimmed cheese for the genuine article, and in short weights. The first is a somewhat common offense, because this practice was so general prior to the existence of the food law that to effect complete reform is a slow and difficult process.

A classified list of the cases prepared by this laboratory is as follows:

Milks and creams.....	198	Butter.....	14
Cheese.....	44	Dry milks.....	7
Ice creams.....	40	Ice-cream thickeners.....	2
Evaporated milks.....	21		
Condensed milks (sweetened).....	21	Total.....	347

Of these, 163 were prepared from analyses made in branch laboratories of fresh milks and creams and ice creams, and 30 from analyses of fresh milks and creams made by the health officer of the District of Columbia. As usual, much work has been done in the study of methods for the analysis of dairy products.

DRUG INVESTIGATIONS.

IMPROVEMENT OF METHODS.

Much time has been devoted during the last fiscal year to special investigations for formulating and adapting analytical methods to the examination of various drugs, simple and mixed. Special attention has been given to the following subjects:

ACETONE AND METHYL AND ETHYL ALCOHOLS.—Methods for the estimation of methyl and ethyl alcohol and acetone in mixtures have been studied with a view to improving and simplifying these determinations, and the results already obtained justify further work along this line.

ALCOHOL AND ETHER.—The separation and estimation of alcohol and ether, especially in mixtures containing essential oils, was studied, the method depending upon the separation of the ether by means of condensers and alcohol traps maintained at a temperature between the boiling points of the two substances and the subsequent estimation of the ether in aqueous solution by means of the refractometer. The procedure gives promise of success.

MORPHIN COMBINATIONS, ETC.—Methods for the estimation of morphin salts in preparations as such, and morphin in opium preparations such as paregoric, soothing sirups, cordials, laudanum, and Chinese pills, have been made a special study and the results obtained are very satisfactory. This method appears in Chemistry Bulletin No. 137, recently issued.

SYNTHETIC PRODUCTS.

During the past fiscal year the synthetic products laboratory has examined 197 samples, of which 119 were interstate, 27 import, and 51 unofficial. As the result of such examination 60 cases were recommended to the chief of the bureau for prosecution and 3 for seizure. During this period 18 Notices of Judgment dealing with products of this nature have been issued. The illegal samples included a great variety of products—such as preparations for headache, colds, grippe, rheumatism, fevers, asthma, etc., medicinal wines, soft drinks, and beverages, various gums, as tragacanth, Indian mesquit, ghatti, asafetida, etc. Several samples were examined for other departments and numerous check analyses were performed for other laboratories.

Cooperative work on headache mixtures and similar products has given some gratifying results, several new methods relating thereto having been elaborated, notably one for the estimation of salicylic acid in the presence of boracic acid. Methods for the quantitative separation of caffeine, acetanilid, sodium salicylate, and alcohol in the presence of essential oils have been fully tested and approved.

In connection with the examination of powdered gum tragacanth, attention was directed to the desirability of improving the methods of checking the purity of this commodity. After considerable experimentation with authentic samples of the whole and powdered gums, and also with whole and powdered so-called Indian gums (*Sterculia urens* and *Cochlospermum gossypium*), extensively employed as adul-

terants for pure gum tragacanth, it was found that the amount of volatile acid (acetic acid) generated on treatment with dilute phosphoric acid and subsequent distillation with steam could be used as an indicator of the purity of such gums, inasmuch as the Indian varieties yield approximately seven times as much volatile acid as pure gum tragacanth.

ESSENTIAL OILS.

During the year 163 samples of essential oils have been submitted to examination in this laboratory; of this number 15 were reported as adulterated or misbranded. A number of unofficial samples of oils have been examined with the object of determining the best methods for their analysis, especially with respect to the determination of the ketones and aldehydes by the hydroxylamin titration method. A variety of samples have been submitted to this laboratory for check analysis, including both import and interstate samples of essential oils, as well as samples of cod liver oil compounds, spirits of camphor, etc.

A chemical investigation of oil of chenopodium has been carried on, having in view especially the extension of our knowledge of the properties of the peculiar medicinally active ingredient, ascaridol. The results of this investigation, so far as completed, are to be found in Chemistry Circular 73.

PHARMACOLOGICAL INVESTIGATIONS.

These investigations were devoted largely to the pharmacology of caffeine and were conducted along the following lines:

(1) Research work on the comparative toxicity of caffeine in different species of animals. The results have been compiled.

(2) A number of experiments on the toxicity of caffeine under pathological conditions, with additional work on the effects of feeding caffeine over long periods of time, i. e., chronic caffeine intoxication in cats, dogs, and rabbits, both in normal and in fasting animals.

(3) The work on caffeine glycosuria has been practically completed.

(4) The study of the alleged destruction of caffeine by the liver has been completed; no destruction of caffeine was observed.

(5) The effect of caffeine on protein metabolism in dogs was also concluded. The results obtained show that protein metabolism is not disturbed to any extent during the administration of the drug, although symptoms of caffeine intoxication were manifested. When caffeine was withdrawn, however, there was a marked increase in the elimination of nitrogen.

(6) The study of the elimination of creatin and creatinin in rabbits, begun in the previous year, was concluded. It was found that caffeine stimulates the elimination of creatin, but has no effect on the creatinin.

(7) Additional experiments on the circulatory changes produced by caffeine were made, but this work has not been completed.

(8) The demethylation of caffeine in the body has been studied during the past year in rabbits and dogs, under normal and under pathological conditions. The results indicate retarded demethylation in chronic alcoholism in rabbits.

(9) The elimination of caffen in the urine of rabbits was studied and the results obtained thus far indicate that it is partly eliminated unchanged.

Other investigations are as follows:

(1) The pharmacology of the alcohols and of other compounds of the fatty acid series was investigated and the influence of alcohol on protein metabolism was studied in dogs. The results obtained indicate that small doses of alcohol exert a sparing influence on body protein, while large doses favor protein katabolism.

(2) A good deal of work has been done on the pharmacology of oil of chenopodium and ascaridol. Experiments on this subject are still in progress.

(3) Much of the information acquired on the physiological effect of various drugs and chemicals was used in connection with the enforcement of the food and drugs act and the preparation of expert testimony along these lines. Especially was this true of the caffen data in its relation to so-called medicated beverages.

CHEMICAL REAGENTS.

During the last year 427 chemical reagents, supplied to the Bureau of Chemistry and branch laboratories on contract, have been examined. The quality of chemicals supplied during the year does not compare favorably with those supplied in 1910. This is attributed to the fact that contracts were awarded to bidders who had not been accustomed to supplying goods to the bureau for analytical purposes. Numerous samples have been supplied by the Government General Supply Committee, with which the Division of Drugs has cooperated in every possible way.

The following represent a portion of the rejections made during the year:

Benzol, chemically pure, contained organic impurity.

Acetone, yellow in color, contained organic and nonvolatile matter.

Rochelle salt, suspended foreign material giving turbid aqueous solution.

Hydrochloric acid, low in acidity.

Potassium oxalate and citric acid contained heavy metals.

Ammonium hydroxid, low in ammonia content.

Potassium sulphate contained nitrogen.

Potassium peroxid, high in acidity and deficient in hydrogen dioxid; one shipment contained acetanilid.

Several shipments of absolute alcohol were found to contain fusel oil.

A number of lots of ether, chemically pure, absolute, were rejected owing to the fact that the article contained an excess of nonvolatile material and gave the test for the presence of peroxid.

The manufacturers, however, work in hearty cooperation with the bureau in its efforts to obtain chemicals satisfactory for analytical purposes. The special glacial acetic acid on contract required to comply with the sulphuric-acid-bichromate test has been found to meet the requirements. It is very desirable that specifications for chemical reagents be established and this work is in progress. As a further step in this direction, the following recommendations were made at the last meeting of the Association of Official Agricultural Chemists, held in Washington, November, 1910, by the committee on testing of chemical reagents, of which the chief of the division of drugs is chairman.

(1) That the designation "C. P." be applied only to such chemical reagents as are free from recognizable impurities.

(2) (a) That the term "reagent" be applied to all commonly employed chemical reagents which are free from all impurities to such an extent as to permit their use in all ordinary qualitative and quantitative chemical analyses. (b) That a specific set of tests, with which the chemical must comply, be drawn up and adopted for each chemical reagent.

(3) That the term "special reagents" be employed only for certain reagents to be used chiefly for making special determinations which require absolute freedom from certain impurities.

COOPERATION WITH THE POST OFFICE DEPARTMENT.

The Drug Division has continued to cooperate with the Post Office Department in its effort to withdraw the privileges of the mails in cases of the violations of the postal laws involving medicinal agents. To this end the analysis of the samples of medicines used is supplemented by a study of all of the claims and representations made for the products. Twenty-one of these treatments were investigated during the past year, each comprising from one to ten medicines. Seven of them were so-called "epilepsy cures." None of the latter are sold in the shops, but all were obtained through the medium of the United States mails. Each was claimed to bring about a complete and permanent cure of epilepsy, irrespective of kind and cause, if taken according to directions. The representations were conveyed chiefly in newspaper advertisements and printed matter sent through the mails to prospective purchasers; very few claims appeared upon the label of the containers themselves. The representations were generally to the effect that as a result of the use of the treatment the epileptic seizures are lessened in frequency and severity, any diseased condition of the brain is corrected, and brain tissue which has been damaged or destroyed is replaced; this change goes on steadily until the whole nervous system is restored to a sound and normal condition, and, the cause being removed, the convulsive seizures no longer make their appearance and the epilepsy is cured never to return. Such claims are false and misleading in the highest degree. The medical profession knows of no substance or mixture of substances which is capable of creating new brain or nerve tissues in place of the old which has been removed or destroyed. Some of the treatments comprised several medicines, but in nearly every instance the essential ingredient was found to be one or more of the bromids. While these agents may in some cases postpone the epileptic attacks, their effect is temporary and palliative only, and according to the best authorities they can not be considered as cures for epilepsy.

Three so-called "cancer cures" were examined. One of them, which was represented among other things to be a positive, permanent, painless cure for the disease, was found to consist of two medicines, one of which was a solution of sulphur and sodium hydroxid in water, and the other a solution of Epsom salts with a little vegetable matter. Imported Limburger or Swiss cheeses and glycerin, kneaded to a paste with the fingers and applied to the cancer, formed an important part of the "cure." Such a treatment can not cure cancer, and its

use may cause the loss of invaluable time at the only stage when cancer is believed to be amenable to radical treatment, namely, the very earliest stage. Another cancer "cure" was found to consist essentially of potassium iodid, an agent which is frequently employed in the treatment of syphilitic affections. It often forms a part of "cures" of this kind, its use being really directed to the relief of syphilitic troubles which are erroneously believed to be of a cancerous nature. The Post Office Department has issued nearly a dozen fraud orders in this class of cases and as a result the mail-order cancer cure business has practically been suppressed in this country.

Two consumption "cures" were investigated. Both were found to contain ordinary medicinal agents which might perhaps have a temporary and palliative effect in relieving the distressing symptoms of the disease, but which can not in any proper sense be considered as cures for consumption. Millions of dollars are spent annually to retard the progress of pulmonary tuberculosis, but it is well known that there is at present no specific for its treatment. Anyone engaged in exploiting a so-called consumption "cure" is simply trafficking in the life and health of the people, since the time lost in such a way may result in the death of the victim by delaying the use of proper hygienic measures.

In addition, there were investigated disguised treatments for the prevention of conception and for the production of abortion, for the restoration of hearing, and for the cure of rheumatism, and other diseases.

STUDIES OF FOODS AND FOOD MATERIALS.

SPECIAL INVESTIGATIONS OF THE DIVISION OF FOODS.

FRUIT PRODUCTS.

The economic studies relating to fruit products have been continued in cooperation with the pomologist in charge of field investigations of the Bureau of Plant Industry. In connection with the study of the utilization of surplus fruit the yield of juices made in different ways from various fruits has been studied on a scale sufficiently large to be easily extended to commercial proportions. Special attention has been given to the causes of the disappearance of flavor in the juices of citrus fruits after sterilization. The preparation of dried sugared pineapples has been studied on a scale large enough to secure data applicable on a commercial basis. The investigation of the ripening of persimmons without softening has been continued and has shown that this can be best effected by confining the fruit in a closed space in an atmosphere of carbon dioxid. Thus far the experiments have been conducted on a laboratory scale, but field work is planned for the coming season as a result of which it is believed that definite directions can be given for commercial processing by the grower.

A study of the respiration of fruits as an index of their physiological activities has been continued and extended to cover the effect of temperature on the vital processes. It has been found that various fruits differ widely in their rate of respiration, but that they are similarly affected by changes in temperature. The respiration in all

cases was increased about 2.5 times for each rise in temperature of 10° C. In cooperation with the Office of Nutrition Investigations, Office of Experiment Stations, the bureau is now studying the heat evolved by the banana during ripening in the respiration calorimeter.

THE MANUFACTURE OF CITRUS BY-PRODUCTS.

Owing to the difference in economic conditions the methods employed for the manufacture of citrus by-products in southern Europe are not applicable in the United States. A laboratory study has been made with a view to increasing the use of mechanical devices and otherwise lessening the cost of production, and has reached the stage where it seems advisable to conduct the work on a commercial scale. It is proposed, therefore, at the beginning of the next packing season, to equip a small experimental plant for the study of the economic manufacture from waste citrus fruits of citric acid, citrus oils, juices, and several preserved products.

ESSENTIAL OILS USED FOR FLAVORING FOOD PRODUCTS.

An investigation of citrus-fruit oils extending over several years has been completed during the past year, and a report upon the subject is in preparation. A study was also made of the manufacture, composition, and methods of analysis of the oils of wintergreen and birch and of methyl salicylate. It is important to know the distinguishing characteristics of these products, as the last two are frequently substituted for the wintergreen. Other essential oils, such as oil of sassafras and spearmint oil, were also studied.

FIELD EXPERIMENTS IN THE MANUFACTURE OF CIDER VINEGAR.

In order to determine the changes taking place during the conversion of cider into vinegar under commercial conditions, a field laboratory was established at a factory in Benton Harbor, Mich., and also one in Albion, N. Y. The plan of the work was to make analyses of the cider used as a vinegar stock and then collect samples of this after it had passed through generators and been converted into vinegar, in order to determine the exact changes which took place during this acetification.

This experiment was carried on during a period of several months, as it was found to take some time for the effect of a change in composition of the cider to show itself in the finished vinegar. Some very valuable information was obtained, showing that in the acetification of the cider by the generator process practically the only change is the conversion of the alcohol into acetic acid. It was also shown that the generator vinegar is very much more uniform in composition than vinegars made by the old-fashioned barrel process, during which they are subjected to varying conditions, and that certain relations exist between the ingredients of the generator vinegar which are valuable in detecting adulteration of the commercial product. The glycerin present in the fermented cider was not affected by the conversion into vinegar, and a very valuable factor was thus obtained for the detection of adulteration, which has been used in a number of cases to great advantage, proving conclusively the dilution of cider vinegar with the distilled product.

THE INFLUENCE OF TIN RECEPTACLES ON THEIR CONTENTS.

This study has been continued during the past year. A set of samples of 11 varieties of foods packed in lacquered containers of heavy and light coating were examined for the second time after the interval of a year, to note the increase of tin content on storage. Samples of 22 additional varieties of foods were examined 6 months after canning, in order to determine the amount of tin contained in the foods at the earliest date at which they are likely to reach the consumer. Additional samples of these goods are retained for future examination. The results thus far obtained indicate that some of the acid fruits when packed in plain tin contain from 200 to 250 mg of tin per kilogram of material, exclusive of juice, at the earliest date on which they are likely to reach the consumer, and that this amount is greatly increased after a year's additional storage. The amount of tin dissolved by the food is greatly decreased by the use of lacquered tin.

Special attention has been given to the question as related to a number of foods which are practically free from acid, but which are known to attack tin to a considerable extent, such as canned shrimp, pumpkin, and string beans. Since this action was most pronounced with shrimps, they were first studied, and it appeared that the action in such cases is due to the presence of volatile alkalies, inasmuch as mono-methyl-amin was found in considerable quantities in canned shrimps and amins and amino acids are present in the foods mentioned.

EDIBLE OILS.

In collaboration with the Bureau of Plant Industry, progress has been made in the clarification of peanut oil, and a study has been inaugurated of the chemical composition of various soft-shelled pecans and of the oil contained by them, with a view to determining whether the composition would shed any light on the distinguishing features of various varieties.

WORMY AND DECOMPOSED FOODS.

Certain classes of dried fruits in a wormy and partially decayed condition continue to be placed on the market. This results from several causes—sometimes from curing by imperfect methods and in insanitary surroundings, and sometimes from careless storage, the products being exposed unduly to the attacks of insects. In ripe olives decay has sometimes resulted from the practice of discarding the brine in which they were originally packed, for the purpose of saving freight. In such cases, especially when shipments are exposed to unusual delay, the goods reached this country in a condition that did not warrant their use as food. The risk involved in this method of shipment has been pointed out.

It has frequently happened also that a considerable portion of the ripe olives shipped in bulk were contaminated by worms. Figs and marrons, imported into the country to a considerable extent in the fall, were frequently found to be wormy and sometimes moldy and decayed. The efforts of the department in this direction have

resulted in a great improvement in such imported products, and it is believed that the foundation has been laid for far greater improvement during the coming season.

An extensive study has been made of the manufacture of foods from waste, trimmings, and especially from material undergoing decomposition and of the elaboration of methods by which the use of such material could be detected by the examination of the finished article. The first attention was given to the study of tomato ketchup, with the result that it is now possible to distinguish in a general way the product made from sound, ripe, and properly cleaned tomatoes from those in the preparation of which unfit material was employed. During the last year the bureau has come in contact with a large number of manufacturers of ketchup, and it is believed that great progress has been made in the elimination of the use of decomposed material in the manufacture of this product. A beginning has been made in the application of the same and similar methods to the inspection of manufactured fruit products such as jellies, jams, and marmalades. The question is still being studied both in the laboratory and in the factory.

CAUSES OF SPOILAGE OF CANNED FOODS, KETCHUPS, ETC.

Work was continued during the past season on food preservation and the methods of preventing spoilage. The study of the cause of reddening of dried cod and other salt fish was continued, especially at Gloucester, Mass. Many suggestions were made for improving the sanitary condition of the water supply and of the fish factories, which, if carried out, it is believed will lessen infection and the resultant spoilage.

During the manufacturing season experiments were continued at Lafayette, Ind., in the making of tomato ketchup, using pulps of varying quality and cleanliness and in different states of spoilage. The completed product gives evidence of the character of material used, and the method of manufacture can not completely disguise the facts when the product is subjected to microscopic and chemical tests. The three most important factors in producing a clean ketchup are the selection of the fruit, thorough washing, and rapid handling of the product in the course of manufacture. Studies were also continued on the different factors which tend to preserve the ketchup. It was found that no one of the spices nor all the spices in combination when used only in the quantities necessary for flavoring had any preservative effect. The keeping quality depends principally on quality of the raw product, cleanliness of manufacture, the concentration of the tomato pulp with the sugar and vinegar, and upon sterilization.

The work upon canned goods consisted largely in a study of the proper quantity of material to use in the can, and the degree of temperature and length of time that should be given in processing in order to get the best result in the finished product. There is opportunity for improving the general quality of canned goods, but the specific directions can not be given until the results of several seasons' work have been accumulated.

FOOD COLORS.

Two extensive studies on coal-tar colors have been brought to completion during the past year under the direction of B. C. Hesse, of New York, a color expert appointed for the purpose of making these investigations. The food-inspection laboratories at Washington, at New York, and at Seattle have also done a great deal of work along this line. The first investigation included the original work done in the bureau and also a comprehensive survey of the literature with special reference to the harmfulness of coal-tar colors and their physiological effects. These data, on which the selection of the seven permitted colors was based, are in the hands of the printer. The second study consisted in the investigation of methods for determining the chemical identity of coal-tar dyes used in food products, as a result of which 134 different chemical individuals have been grouped in 10 analytical tables. Of these only 19 are paired, leaving 115 dyes which can be conclusively identified by these tables without known specimens. The dyes of each of these pairs can be thus distinguished from every other pair and from each of the other 115 dyes, but the pairs can be distinguished from each other only by having known specimens of at least one member of the pair. In no case is one of the permitted dyes of Food Inspection Decision No. 76 paired with another dye. The tables include all but three of the dyes said to be used in food products, and these appear to be now obsolete; they also include all dyes that have been examined physiologically and which are not obsolete or impracticable for use in foods. These data are now in process of compilation.

The investigation of the character of artificial colors used in various food products has been continued and admission into the United States has been denied to foods colored with unpermitted dyes. Considerable attention has also been given to the natural coloring matter in foods, especially in flours in connection with the bleaching process, and the application of the spectroscope to the general problem. A study has also been begun of the coloring matter of the common foods which have a characteristic color with a view to establishing another means for the detection of the substitution of one food for another.

MANUFACTURE AND COMPOSITION OF EGG NOODLES.

This product is assuming considerable importance, and it has become necessary to be able to determine from the examination of the finished article the proportion of eggs used in its preparation. With this in view, a representative of the bureau visited a large factory and with the assistance of trained workers manufactured under commercial conditions egg noodles made with varying amounts of egg and from various classes of eggs. The analyses of these preparations have afforded valuable data for judging accurately of the quality of commercial products.

COMPOSITION OF BEER MADE FROM VARIOUS MATERIALS.

In collaboration with a local brewery, samples have been taken of various beers at different stages of their manufacture, and the data obtained from their examination are believed to be of value in the

interpretation of results obtained in the analysis of beer sold on the market. In connection with the study of imported foods, attention has been given to the character of lupulin imported by brewers for use in the manufacture of beer. Many shipments are found to contain an excessive amount of mineral matter, and the Treasury Department has required that the percentage of ash or mineral matter be stated on the label, provided the products are below the standard strength of the Pharmacopœia.

MISCELLANEOUS INVESTIGATIONS.

A number of special investigations have been made, involving in the aggregate much time and expense with a view to securing data necessary to the enforcement of the food and drugs act. Among these may be mentioned the following: The meaning of the term "maraschino" and the composition of the product bearing that name, samples of the genuine product from Zara, Austria, having been collected by the American consul. Attention has been given to the Spanish pimento, which is imported into the United States in considerable quantities. This product is often sold as paprika, and shipments frequently have an excessive amount of ash, due often to dirt and sand clinging to the product and ground with it. As a whole it has been found that the pure capsicums do not contain more than 6.5 per cent of mineral matter, but a special investigation is being made regarding the normal ash content of this variety.

Attention has been given to the Norwegian and Spanish anchovies, and the department has held that they may be so designated, provided the labels also contain in the English language the word "sprats," or if labeled entirely in the Norwegian or Spanish language the label bears the word "Brisling," or some other equally appropriate term showing the true character of the fish.

The manufacture and chemical composition of gelatin has been studied, with a view to securing data by which gelatin made from decomposed or otherwise inedible material might be distinguished.

ANALYTICAL METHODS.

For the sake of securing greater uniformity in analytical results and to prove the efficiency of new methods that are proposed, samples are sent from time to time to the various laboratories of the bureau for examination and report. The results are carefully studied, and where discrepancies occur (due often to the lack of detail in the statement of the method) the matter is taken up by correspondence or by the study of additional samples, until the difficulty is eliminated. Among the methods studied in this manner during the last year are methods for the detection and determination of organic acids in common foods; methods for the detection of deterioration and decay in such products as ketchups, jellies, and jams; methods for the examination of noodles with a view to determining the amount of eggs used in their preparation; methods for the examination of flavoring extracts and essential oils.

EXAMINATION OF FOODS FOR OTHER DEPARTMENTS.

From time to time during the year samples of foods have been examined for other departments of the Government, such as the Army, the Navy, the Panama Canal Commission, and the Insane

Asylum of the District of Columbia. Over 400 samples of foods were also examined for the General Supply Commission for the purpose of assisting them in awarding contracts for the present fiscal year.

VOLUME OF WORK.

It is difficult to make an adequate statement of the volume of work accomplished. The number of samples is a very unsatisfactory index of the amount of work really done, owing to the wide variation in the skill and time expended on different problems and different classes of products. As a rough estimate of the volume of the work, however, it may be said that the samples actually numbered and examined in the division of foods during the fiscal year aggregated 5,028, several numbers of course being assigned in some cases to the samples for a single investigation.

WORK OF THE FOOD RESEARCH LABORATORY ON PERISHABLE PRODUCTS.

The food research laboratory has continued the study of the handling of poultry and eggs, improving quality and lessening loss thereby, as well as furnishing information of assistance in enforcing the food and drugs act.

FIELD INVESTIGATIONS ON POULTRY.

In July, 1910, the field branch of the food research laboratory was transferred from a poultry packing plant in Atchison, Kans., where investigations had been going on for about seven months, to southwestern Iowa. Here two poultry packing houses were sufficiently close together to be drawn upon for material for laboratory investigation and for shipping experiments. The laboratory was installed in a room in one of the packing houses and was always open to visitors. The breadth of the work is well indicated by the variety of persons who came to the laboratory. They ranged from professors in agricultural colleges, keen to provide their students with the newest facts concerning food investigation, to the railway refrigerator-service man, anxious to get perishables to market in sound condition, and the housewife who wants to know how to determine the wholesomeness and desirability of the poultry she purchases.

Through the cooperation of the different branches of the industry arrangements were made for the continuous observation and investigation of poultry shipments from the time of killing, in Iowa, to the sale to the consumer in New York. The special problem selected was a comparison of "dry packing" with water chilling and "ice packing." The dry-picked poultry was chilled in cold air until the temperature of the body cavity indicated that the animal heat had been removed; then it was packed in boxes, holding 12 birds, shipped in a refrigerated car, and maintained under dry refrigeration until marketing was finished. By the method of water chilling and "ice packing" the birds, after picking, were thrown into tap water for a short time; then into water and ice; and finally into crushed ice, in which, packed in barrels, they were shipped for the six or seven day haul to New York, where they were kept in actual contact with ice until the close of marketing. In order to determine the comparative value of these two methods of

packing, chickens killed in the same way, at the same time, were chilled and packed as above indicated and shipped, side by side, in the same refrigerated car to the same receiver, and marketed, side by side. They were examined bacteriologically and chemically in the packing house before they were shipped, and after every change in environment samples went to the laboratory, where analyses determined the rate at which changes in the flesh were progressing. Visual inspection along usual market lines was, of course, a part of the testing. Such shipments were sent once or twice a week from September until February, when the poultry season for that part of the country practically closed.

The laboratory was then transferred to another poultry packing plant in Nashville, Tenn. This location was chosen because of the very rapid development of the poultry and egg industry in Tennessee and Kentucky and the important rôle which this part of the country plays in furnishing fresh eggs and poultry to the North during the winter season. The results, as measured by a keen interest on the part of the poultry men of the section and an endeavor to adopt better methods of handling for both poultry and eggs all along the line, have fully justified its selection. The same problem, namely, dry and wet chilling and shipping, is studied at this point. The general practice in the West is to ship for long hauls dry packed; the South has almost invariably shipped wet packed during warm weather. That each method of procedure might have a fair trial it has been deemed advisable to conduct experiments on the commercial routine in separate territories where each has had the preference. The length of haul is about the same in each case. The receiving point is the same. The establishment of the laboratory in the packing house itself permits of a heartier cooperation between the investigators and the industry than would otherwise be possible. General problems of all kinds are discussed, and experimentation, with the assistance of the field force, is being pushed along many minor yet important lines by the packers themselves.

Aside from the main problem chosen for the season's work, the field branch has conducted many side lines of study, testing theories of marketing by holding produce under conditions similar to those of marketing and determining in advance of shipping the general trend that the results would be likely to follow. Each problem has been referred to the laboratory, as well as subjected to careful tests such as are used by the trade to determine quality and condition. The visiting of poultry plants in the vicinity of the field station, the discussion of improved methods of handling with individuals, informal talks illustrated by charts, etc., on marketing and dressing, as well as meeting with more formal gatherings of organized associations of all branches of the industry, would entirely occupy the time of one field man should all invitations be accepted. The educational work at the receiving center among commission men, jobbers, retailers, carriers, warehousemen, etc., has progressed along many lines. An illustrated talk was given in New York, showing the usual procedures for the receiving, feeding, killing, dressing, chilling, packing, and shipping of poultry in the western producing section. This was followed by an exhibition, in one of the refrigerated warehouses in the city, of poultry dressed in various ways 1,000 miles from New York and

shipped in refrigerated cars. The condition of the birds on arrival depended upon the manner of dressing, as was plainly apparent to even the casual observer. Such practical demonstrations to the industry of the results of proper handling on the condition, appearance, and eating quality of the birds are creating a higher and more rigid standard of excellence and decreasing the poorly handled poultry found on the market.

FIELD INVESTIGATIONS ON EGGS.

HANDLING OF EGGS.

The handling of eggs has received a goodly share of attention in the field work. The condition of eggs of varied histories brought to the packing house in diverse ways has been studied on their arrival. They have been subjected to varied experimental handling and finally a number of shipments have been made, especially of the much-debated "Southern" egg to determine its ability to travel, store, and market. Experimentation along this line is especially desirable in view of the enormous numbers of southern eggs lost by bad handling and their lowered market value due to poor condition.

A practical demonstration of the field work was given during the early summer to the members of the Southern Poultry and Egg Carlot Shippers' Association when the organization meeting of that body was held in Nashville, Tenn. The demonstration, which was given in the packing house, involved killing, picking, chilling, and packing poultry, and the candling, chilling, grading, and packing of eggs. A lantern-slide talk showed as plainly as possible poultry conditions in other territories, and the laboratory, with its varied apparatus, was thrown open and its work explained.

FROZEN AND DESICCATED EGGS.

The actual condition of damaged eggs of various sorts—as cracked eggs, slightly incubated eggs (such as appear by the thousand in every market during hot weather) shrunken eggs, etc.—has been made the subject of a special investigation during the summer of 1911, as well as the study of frozen and dried eggs and egg products, the great bulk of which are prepared in the producing sections of the Central West. It has seemed desirable to conduct the experiments in that section, cooperating with the industry as heretofore, and accordingly the Omaha food and drug inspection laboratory, with its equipment and working force, was assigned to this investigation for the season, and the laboratories of the bureau in Washington, as well as the food research laboratory, were drawn upon for workers to prosecute the inquiries. Egg-breaking establishments within the radius of a night's ride from Omaha were visited and working relations established. Eggs from various sources were secured and examined bacteriologically and chemically, their quality varying from the highest grades to the eggs unfit for food as judged by odor, taste, and appearance. Samples of eggs broken and handled in the manner customary in the various breaking plants were sent to the laboratory and examined. Special methods of breaking and handling were tried, and the results carefully compared, that better methods for the saving

of eggs fit for food might be found and that eggs unfit for consumption might surely be eliminated. It is very desirable that eggs which are of doubtful shipping quality, yet still wholesome, should be conserved at the source of production, but such conservation has not heretofore been always conducted in a manner calculated to give the best results for either the consumer or the producer. The investigation outlined aims to remedy these defects so far as possible.

Any report of this field work would be incomplete without a statement concerning the industries cooperating in the solving of the problems. The poultry and egg industry, as organizations and as individuals, have placed every facility at the disposal of those conducting the investigations. While it is with the shipper on the one hand and the receiver on the other that most of the practical work has been done, yet the carrier who is endeavoring to transport the goods to market in a sound condition also cooperates in the campaign to preserve perishable products, and the warehouseman who stores perishable products is another ally in the endeavor to conserve food in a wholesome, palatable condition. Standing as the warehouseman does, between the shipper on the one hand and the distributor of foods on the other, his opportunity for influence and education is broad and varied, and his assistance in the promulgation of the doctrines of good handling is essential.

LABORATORY INVESTIGATIONS ON EGGS AND POULTRY.

At the food research laboratory in Philadelphia the commercial problems are put on a firm, scientific foundation before field experimentation is seriously considered. Chemistry, bacteriology, and histology are brought to bear on the questions, then on a foundation of fact field work is begun and not only the results but the reasons underlying them can be given to the industry. The study of the rôle played by temperature in the history of bacterial and chemical changes in flesh has been pushed. This work has continued now for about four years and a great mass of data has been collected from which, from time to time, practical information has been furnished to meetings of industrial organizations, Congressional committees, etc. The compilation of the detailed scientific data obtained is under way. Quite aside from the study of temperature proper, a number of examinations have been made of chicken flesh subjected to routine marketing. When the shipments from the field laboratory reach the receiving center, samples are sent at once to the laboratory, where chemical and bacteriological examinations are made; and again several times during the marketing samples are sent for such examinations. These analyses will aggregate many hundreds, and, taken in connection with the environment to which the flesh has been subjected, will furnish valuable data on its decomposition.

A laboratory study of eggs subjected to different methods of handling is also being conducted, as was indicated in the statement concerning the work in the field. Eggs have been analyzed after keeping for varying periods, under varying conditions. This phase of the research work has also been under way for a considerable period, and the results are now being compiled. The study of eggs in transportation and during marketing—that is, the shipments made from the

producing to the receiving centers—is carried through by means of samples sent to the laboratory, just as the poultry samples are sent.

At the Philadelphia laboratory chemical analyses of 371 samples of chickens, 75 samples of eggs, and 3 miscellaneous samples were made, aggregating 3,844 determinations; 1,384 bacteriological examinations of chicken were made, and 88 of eggs. In the field laboratories chemical examinations of 118 lots of chickens and 173 lots of eggs are reported, accompanied by 173 bacteriological examinations of eggs and 504 of chicken flesh. At Omaha, where the desiccated-egg investigation was opened on June 20, 1911, 103 bacteriological examinations of 46 samples of eggs and 5 samples of water were made, accompanied by 281 chemical determinations prior to the close of the fiscal year. This represents a total of 1,888 bacterial examinations of chicken flesh and 364 of eggs, with chemical examinations of 489 samples or lots of chickens and 294 of eggs.

BACTERIO-CHEMICAL INVESTIGATIONS.

During the past year the principal bacterio-chemical investigations conducted at Washington have concerned the conditions surrounding the oyster and clam industry and the frozen and desiccated egg products. These are continuations of investigations begun in preceding years and decided improvements have been made along these lines. The frozen and desiccated egg industries have been studied closely to determine if possible the real cause of the unsatisfactory products often found on the market. During this work numerous eggs in the shell have also been examined to supply a basis of comparison. Examinations of the mineral springs and bottling houses and inspections of the sources of the springs and bacteriological examinations of the products have been continued with good results.

Edible gelatin has received considerable study during the past year, including the examination of the raw materials and of the processes of manufacture. Much work has been done on milk, cream, and ice cream as served on dining cars. In connection with other laboratories many examinations of ketchups, tomato pastes, and tomato products in general have been made.

The nature and number of the bacterio-chemical analyses made are shown by the following tabulation of interstate samples and a statement of the number of research samples handled:

Interstate samples:		Interstate samples—Continued.	
Butter.....	6	Ice cream.....	34
Cream (raw and pasteurized)...	23	Milk (raw and pasteurized)...	133
Eggs:		Miscellaneous.....	67
Desiccated.....	99	Oysters.....	145
Frozen.....	220	Ketchup and other tomato	
Shell.....	7	products.....	368
Liquid.....	16	Water (bottled and others)...	55
Egg compounds.....	4		
Fish.....	18	Total	1,250
Gelatin.....	55		

The research samples included 23 samples of antiseptics, 112 samples of cream and milk, 103 samples of imported dried albumen, 909 samples of desiccated, frozen, and shell eggs, 52 samples of gelatin, 28 samples of infant foods, 15 samples of fish, 13 samples of antiseptic

gauzes and bandages, 51 samples of oysters, 312 samples of water, 16 samples of soap, miscellaneous 73, a total of 1,706 research samples, and a general total of 2,956 samples examined during the year.

SUGAR AND SUGAR PRODUCTS.

MAPLE PRODUCTS.

The investigation on the maple products of the United States, begun two years ago, has been completed in part. The original samples collected have all been analyzed, as well as 110 samples collected during the past year, and the results of the investigation of maple-sap sirup have been published in Chemistry Bulletin No. 134. The analytical figures on maple sugar and maple-sugar sirup have been compiled; but one or two conditions have been found on which more work will be necessary before this part of the investigation can be considered finished. This work will be done during the coming maple season. It has been noted that the metal containers for sap, and also the metal from which evaporators are made, seem to influence the product greatly. A special study of this point during the last season gave encouraging results and will be continued. The studies of the chemical composition of sirup and sugar, as affected by the souring of the sap, are still going on. As the maple season is so short, lasting not more than two weeks or a month, the manufacturing of samples must be done during that time and analyses made later, so that but little apparent progress can be made in one season.

EFFECT OF ENVIRONMENT ON SUGAR CONTENT OF MUSKMELONS, ETC.

Having completed a five years' study on sugar beets and another on sweet Indian corn, the environment work for the past year was done on muskmelons. Stations were selected at points in Florida, Arizona, Colorado, Kansas, Indiana, Maryland, New Jersey, and Connecticut, where these fruits are grown extensively. The same strain of seed was planted at each place, having been selected by the Bureau of Plant Industry, which bureau also cooperated by supervising the growing of the crops. Many analyses were made of the crops and the data for the first year, which have been compiled, indicate results of interest and profit. While, of course, no conclusions can be based on one year's work, it appears that the climatic conditions induced by relatively lower temperature and higher altitude interacting on each other result in sweeter melons. Many factors, however, enter into the problem and this year's work is only suggestive.

MOISTURE CONTENT OF LOUISIANA CANE SIRUP AND MOLASSES.

An investigation of the moisture content of cane sirup and molasses was begun during the past sugar-making season in Louisiana. Samples of these products were collected by the official inspector stationed in New Orleans, at the sugar factory, at the Sugar Exchange, and at the plants of the mixers and blenders of molasses in the same place. These samples were sent to Washington and the analytical work thereon has been finished and the results reported to the Board of Food and Drug Inspection.

SUGAR BEETS.

The methods of analysis of sugar beets are under study to adapt them more perfectly to commercial needs. A report giving the results of beet analyses of samples received from all sections of the United States as made during the years 1905 to 1910, inclusive, has been submitted, and included in this is a résumé of the methods for the determination of sugar in the beet, also a bibliography of papers devoted to this subject from 1839 to 1906, inclusive. As in previous years, a number of samples of beets were analyzed for the Bureau of Plant Industry.

SORGHUM.

In order to determine the sugar content of varieties of sorghum grown in different sections of the country and their value for sorghum-sirup manufacture, many samples have been analyzed in cooperation with the Bureau of Plant Industry at their request.

MISCELLANEOUS INVESTIGATIONS.

The chemical investigation of imported honeys has been completed and the data will be compiled as soon as the statements are received from the American consuls at the different ports from which samples were obtained as to the conditions of bee keeping, honey production, and collection there existing.

An important line of investigation has been finished, and results recorded in Chemistry Circular No. 71, on a method of extraction of grains and cattle feeds for the determination of sugars. This contains much work of a comparative nature, shows wherein errors may occur in the present methods, and proposes a new method. As the sugar content of these materials is of much importance in many cases, the need of a method giving accurate results is seen.

The analytical work on the composition and analysis of American glucose and starch sugars is receiving some study. Comparative analyses of many samples have been made and some special tests are being tried. At present only a few scattered analyses of these products are available, and this work will be of material value to the food chemist in his valuation of sirup mixtures containing varying percentages of commercial glucose.

The general methods of sugar analysis are constantly being studied in the Sugar Laboratory. New methods, as they are published in scientific literature along this particular line, are tested and their value for the work in hand determined. Especially is this so in the question of the detection of commercial invert sugar in honey and commercial glucose in sirups and molasses. This often requires much work, and may produce only negative results, which are however, as valuable as positive ones, since it is necessary to know whether the proposed methods are easier of manipulation and yield accurate figures with less chance of error than those now in use.

VOLUME OF WORK.

During the year about 800 samples were received for analysis by the sugar laboratory and, in most cases, a complete examination was made. Besides these, 400 analyses were made in the field on

muskmelons in connection with the study of the effect of environment on their composition. Classifying these samples, the distribution of the work is seen to be as follows:

Sugar-bearing plants:	
Beets.....	147
Cane and sorghum.....	121
Official food samples: Maple and cane sirups, molasses and honeys..	70
Investigation samples:	
Maple sugar and sirup.....	205
Cane sirups and molasses.....	115
Honeys.....	20
Samples from other laboratories and departments:	
Bureau of Engraving and Printing.....	8
General Supply Committee.....	22
Indian Office, Department of the Interior.....	23
Other laboratories of the bureau.....	45
Miscellaneous sirups and sugars.....	24
Total.....	800

MISCELLANEOUS INVESTIGATIONS.

WORK OF THE MISCELLANEOUS DIVISION.

In the miscellaneous division are conducted the examinations of waters, insecticides and fungicides, cattle feeds and grains, trade wastes, hygienic and miscellaneous samples, and research work along these lines.

The administrative work and correspondence of this division, especially that relating to the enforcement of the food and drugs act so far as it applies to waters, cattle feeds and remedies, and grains, the preparation of cases covering such materials, and travel in connection with expert work in court cases have occupied a large part of the time of the chief of the division, who, since December, 1910, has also devoted much time to work in connection with his duties on the insecticide and fungicide board. This work has entailed a large amount of correspondence and the investigation of various problems which have arisen in connection with the enforcement of the insecticide act of 1910.

The miscellaneous division during the past year analyzed approximately 1,566 samples, requiring about 17,064 determinations. Additional samples were examined during the course of special investigations. Following is a tabulated statement of the materials analyzed, showing the scope and distribution of the work:

Imported mineral and table waters.....	39
Domestic mineral and table waters.....	161
Miscellaneous waters.....	53
Imported cattle and poultry feeds and grains.....	4
Domestic cattle and poultry feeds and grains.....	500
Miscellaneous feeds and grains.....	329
Insecticides and fungicides.....	366
Miscellaneous and hygienic samples.....	114
Total.....	1,566

A large number of these examinations were made for other departments of the Government, other bureaus of the Department of

Agriculture, and other laboratories of the Bureau of Chemistry, as follows:

Treasury Department.....	2
War Department.....	9
Department of Commerce and Labor.....	2
Interior Department.....	5
Isthmian Canal Commission.....	13
Department of Agriculture:	
Bureau of Plant Industry.....	386
Bureau of Entomology.....	347
Bureau of Forestry.....	15
Irrigation and Drainage Investigations.....	4
Bureau of Animal Industry.....	1
Unclassified samples examined for various other departments and bureaus and other laboratories of the Bureau of Chemistry.....	78
Total.....	862

EXAMINATION OF WATERS.

The water laboratory, under the food and drugs act, examines samples of mineral and table waters which enter into interstate commerce, and also those which are imported into this country. It also analyzes public water supplies for the purpose of detecting pollution and suggesting remedies therefor; examines water for irrigation and technical purposes, and mineral springs of the United States from source, and studies improved methods of water analysis.

During the year 257 samples were examined, classified as follows:

Interstate samples.....	161	Miscellaneous water samples.....	53
Foreign samples.....	39	Miscellaneous samples.....	4

Of the 161 interstate samples, 39 were found to be adulterated or misbranded, and 6 seizures were made. Of the 39 samples of foreign waters considered, 11 were found to be misbranded and their exclusion from the United States was recommended. The miscellaneous samples examined for this department and other branches of the Government service were as follows:

War Department.....	5	Plant Industry.....	3
Interior Department.....	5	Forest Service.....	12
Commerce and Labor.....	2	Unlisted.....	26
Drainage investigations.....	4		

The investigation of mineral springs at source has been continued and the data obtained collated. The first section of this investigation, which includes the springs from New England, has been issued as Bulletin 139, Bureau of Chemistry. Several other lines of original research previously begun have been continued. The spectroscopic method for lithium, which has been perfected in this laboratory, has been subjected during the past year to further trial and investigation and has definitely proved its reliability and worth. The investigation of the radioactivity of certain mineral waters has been continued and the technique of the method employed has been greatly improved. Some time has been devoted also to the perfecting of methods for the analysis of water for sanitary, technical, and industrial purposes, in cooperation with other official chemists. The character of certain chemicals used in water purification is being investigated, and the quantity of such substances remaining in the water determined.

INSECTICIDES AND FUNGICIDES.

The composition and method of manufacture of insecticides and fungicides are studied, as well as the effect they have on foliage, with the idea of increasing the efficiency of such products and suggesting methods of avoiding injury to vegetation. Investigations to discover new and improved insecticides are always under way and improved methods of examining various insecticides are studied. Since January 1, 1911, when the insecticide act of 1910 went into effect, this laboratory has been charged with the chemical work of examining insecticides and fungicides (other than cattle dips) under said act. It has also been charged with the microscopic examination of various samples of insecticides and fungicides when such work is necessary.

During the year 418 samples were examined, requiring approximately 2,800 determinations. The greater number of these samples have been examined at the request of other bureaus of the department as follows:

Bureau of Entomology:	
Insecticide and fungicide samples.....	335
Miscellaneous samples.....	12
Bureau of Plant Industry:	
Insecticide and fungicide samples.....	7
Miscellaneous samples.....	29
Other bureaus of the Bureau of Chemistry:	
Insecticide and fungicide samples.....	24
Miscellaneous samples.....	11

In addition to insecticides and fungicides, numerous other products are examined, including materials employed in their preparation; the examination of fruits, foliage, and plants which have been treated with insecticides; fruits, hops, and other materials used in the preparation of foods which may have been affected by insecticides, etc.

No inconsiderable amount of time has been devoted during the year to methods for the analysis of insecticides. An exhaustive investigation has been conducted in regard to the solubility of Paris green and lead arsenate in water, in order to establish a method for the determination of water-soluble arsenic in these materials in the enforcement of the insecticide act of 1910. This investigation has involved 3,500 determinations of arsenic. Studies have also been made on methods for the determination of other constituents in insecticides, notably, arsenic in London purple, lead in lead arsenate, and methods for the analysis of Bordeaux mixture.

Much time has also been given to the investigation of problems connected with the properties and effects of insecticides and fungicides, the basic principles of which are chemical. One investigation of this character relative to the problem of fumigation with hydrocyanic acid gas has been carried out in collaboration with the Bureau of Entomology and results of considerable economic importance have been obtained. This study was published as Bureau of Entomology Bulletin No. 90, Part III, "Chemistry of Fumigation with Hydrocyanic Acid Gas." Orchard tests with numerous arsenical compounds and other poisonous materials are being conducted as in the past, in order to study the cause of the injurious effects of such materials on foliage and to discover, if possible, some way of overcoming the difficulty, or some new compound which may be used effectively as an insecticide on peach and other tender-foliage trees and plants, without causing injury thereto.

An investigation begun two years ago relative to the toxic effect of certain elements, notably copper and arsenic, which may accumulate in the soil as the result of using compounds containing these substances as sprays, is being continued. Samples of soils, foliage, and parts of trees have been collected from widely distributed fruit-growing areas and chemical analyses are being made thereof.

Studies of methods of analysis in cooperation with other official chemists have been engaged in during the year, and these, with other miscellaneous work, have required about 600 determinations, making the total number of determinations made in the laboratory for the year approximately 7,000.

The laboratory has been enlarged and the force of chemists materially increased during the latter part of the year in preparation for the enforcement of the insecticide act, which work is now in progress.

CATTLE FEEDS AND GRAINS.

The total number of samples examined in the laboratory studying these materials was 891, necessitating about 6,000 determinations and including samples of cattle and poultry foods, both foreign and domestic, examined under the provisions of the food law, and samples analyzed in connection with the study of such economic problems as the feeding value of forage crops and the composition and value of various grains and cereals, as well as of improved methods for examining such materials.

The methods of determining crude fiber were studied and an improvement made in the apparatus for determining pentosans, which enables the analyst to get more accurate results with less labor. The work on an improved fat-extraction apparatus was continued this year and the results published in Circular 69 of this bureau.

Of the 500 interstate samples of cattle and poultry foods examined, 76 were found to be adulterated or misbranded. The distribution of the total number of samples analyzed was as follows:

Imported cattle foods and grains.	4
Domestic cattle foods and grains.	500
Miscellaneous cattle foods and grains.	329
Miscellaneous samples.	58
Total.	891

Distribution showing cooperative work:

War Department.	4
Treasury Department.	2
Isthmian Canal Commission.	13
Department of Agriculture:	
Bureau of Plant Industry.	347
Bureau of Forestry.	3
Bureau of Animal Industry.	1
Other laboratories of the Bureau of Chemistry.	9
Miscellaneous.	8

TRADE WASTES IN RELATION TO AGRICULTURE.

This laboratory is organized for the purpose of studying the effect of trade wastes on agricultural products, on forests, and on cattle. Particular attention has in the past been given to the study of the effect of smelter wastes on agricultural products, forests, animals, and irrigation streams. This work has practically always been done

at the request of the Department of Justice and in collaboration with the Bureau of Forestry. During the past year the Department of Justice has not required any work along this line, but the laboratory has been engaged in an investigation of the sulphur trioxid content of the foliage of trees which are killed otherwise than by smelter fumes.

MICROCHEMICAL EXAMINATIONS.

INVESTIGATIONS.

While the microchemical work has been continued along similar lines as in former years, certain investigations have been made which, together with the increased demands for examinations under the food law, have taxed the facilities of the laboratory severely. Several lines of special investigation conducted during the year are worthy of special notice.

The field work on the subject of egg desiccation and freezing, which was under way at the end of the last fiscal year, was continued. Many factories engaged in the business of candling and breaking out of eggs were visited, the methods employed closely observed, and the products obtained examined, thus providing each sample with an authentic history.

The work on the microchemistry of alkaloids has been continued, a few more having been studied, together with some new combinations. Many of the combinations studied have been photographed for reference purposes, and frequently the data have been called into use in connection with the examination of drugs and drug products under the law.

The work on ketchup was continued during the last packing season, during which time a number of factories were visited for the purpose of studying the use of decayed or decomposed tomatoes in this product. It is well known that some factories have made up very badly decayed tomatoes or trimmings into ketchup, and it was for the purpose of studying the products of such practices for comparison with the good product that the study was made. The consuming public is usually unable by taste to judge of the character of the raw stock used for some of this cheap product because of the boiling, and the incorporation of spices and vinegar serves to mask to all except an expert the original character of the raw stock. The experience and knowledge gained during this inspection has been of great value in dealing with products of this kind under the food and drugs act. A somewhat similar study was begun during the last part of the year on other decayed fruit products to provide a basis for judgment when they were found in the manufactured form.

In passing upon malt sprouts as cattle food under the food and drugs act it developed that a knowledge of manufacturing methods and practice should be obtained, and for this purpose a member of the laboratory visited three of the malting centers of the Middle West and visited factories, observing the methods used and obtaining for examination representative samples from the various factories. The results obtained will be used in passing on the adulteration of such products.

Insect powder is obtained by grinding the flowers of the pyrethrum plant. In connection with the anticipated enforcement of the insecticide law, the question of the amount of stems to be permitted

was raised. To provide data for deciding this question, grinders were visited and samples collected which are also being studied for the purpose of developing methods of estimating the amount of stems present.

ROUTINE WORK.

The routine work of the laboratory has consumed a large part of the attention of the laboratory force. In general, these examinations may be divided into two classes, namely, interstate samples under the enforcement of the food and drugs act, and, second, miscellaneous samples for the various other laboratories in the bureau and department, and also for other branches of the Government service.

The amount of work done for various branches or departments of the Government has greatly increased, the Post Office Department, Geological Survey, Census Bureau, Navy Department, Isthmian Canal Commission, Government Printing Office, Bureau of Engraving and Printing, General Supply Committee, Department of Commerce and Labor, Smithsonian Institution, the District government, and others sending samples. Collaborative work has also been done with the different laboratories of the Bureau.

The following tabulated list of the samples examined during the year is complete with the exception of some of the samples studied during special investigations, and shows the wide range of materials examined as well as the volume of the work:

Miscellaneous samples:

Food (sago, tapioca, fruits, nuts, spices, coffee, tomato products, infant foods, etc.).....	809
Papers.....	3,708
Insecticides.....	777
Drugs.....	60
Cattle foods.....	34
Dextrin and paste.....	11
Paint pigments.....	14
Alkaloids.....	22
Textiles.....	506
Typewriter ribbons.....	18
Scouring mixtures, water, seeds, etc.....	96

Total.....	6,055
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Interstate samples:

Fruits, nuts, and their products.....	240
Tomato products.....	496
Cattle foods.....	374
Eggs.....	216
Spices and condiments.....	69
Fish products.....	61
Drugs.....	66
Alkaloidal substances.....	43
Teas, coffee, etc.....	39
Sago, tapioca, meat products, etc.....	206

Total interstate samples.....	1,810
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Total for year.....	7,865
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CONTRACT SUPPLIES.

The work of the contracts laboratory during the past year has been been very similar to that of the preceding years. The constant demand for results of examinations at the earliest possible moment

leaves little or no time for systematic research. The largest part of the work of the laboratory has been the testing of miscellaneous contract supplies and the preparation and modification of specifications. Work has been continued on the study of the composition of rubber goods with a view to drawing up specifications for this class of material, but the results so far obtained are not such as to justify proposing a specification. The investigation of paint materials has been continued and a number of exposure tests has been begun. Work has also been done on authentic samples of linseed oil, made from domestic seed in cooperation with the American Society for Testing Materials, and a specification for raw linseed oil made from domestic seed has been adopted which it is believed is fair to both producer and consumer. Plans have been perfected, also, in cooperation with the American Society for Testing Materials, for a very comprehensive series of white-paint tests. Considerable progress has been made on the study of enamel-ware cooking utensils. The quality of platinum laboratory utensils is of the utmost importance to the chemist, and the great advance in the price of platinum in recent years has been accompanied by a more or less marked deterioration in the quality. This laboratory has obtained very valuable information concerning the properties of the different grades of platinum, and while the work is not complete, the information is such as to safeguard the interests of the bureau in issuing specifications for and testing deliveries of platinum ware. As another result of this study serious effort is being made by several manufacturers to improve materially the quality of their ware.

The laboratory made analyses of 2,309 samples for the various departments. The attached table shows the distribution of this work according to the material examined and the departments for which the examinations were made. In addition to the samples reported in the attached table over 4,200 pieces of apparatus were examined for the Bureau of Chemistry.

Number and distribution of samples of contract supplies analyzed in 1911.

Distribution.	Colors, paints and varnish.	Oils, fats grease and wax.	Soap and candles.	Inks.	Typewriter ribbons.	Rubber.	Glue.	Chemicals.	Metals.	Miscellaneous.	Total.	
General Supply Committee.....	514	233	153	100	45	62	12	98	1,217			
Isthmian Canal Commission.....	68	73	31	2	7	1	46	82	310			
Treasury Department ¹	131	44	33	5	33	42	4	292				
Agricultural Department ²	85	110	9	1	24	31	1	9	41	301		
Post Office Department.....	15	6	27	3	1	52				62		
War Department.....		11	2							1	14	
Commissioners, District of Columbia.....	4	4	15				1				20	
Government Printing Office.....		2	2			1					5	
Department of Commerce and Labor.....		5	13								18	
Navy Department.....	1	1									2	
Interior Department.....		8								7	15	
National Zoological Park.....	}	5	11									
National Museum.....							1	1				18
Smithsonian Institution.....												
Panama Railroad.....										2	2	
Superintendent Capitol.....	1		1				1			1	1	
Samples submitted to other laboratories.....		4	1				1			26	32	
Total.....	820	506	265	135	72	38	97	62	52	262	2,309	

¹ Including Bureau of Engraving and Printing.

² Including Bureau of Chemistry.

NITROGEN WORK.

A laboratory is especially equipped for determining nitrogen and to it are referred all samples on which this determination is to be made. A total of 12,077 such analyses were made in the past fiscal year, the samples being referred not only from the laboratories of this bureau but from other bureaus of this department and also from other departments, as follows:

Department of Agriculture:	
Bureau of Plant Industry.....	650
Bureau of Soils.....	30
Bureau of Animal Industry.....	2
Office of Experiment Stations.....	2
Bureau of Forestry.....	6
General Supply Committee.....	3
War Department.....	8
Isthmian Canal Commission.....	4
Navy Department.....	6
Treasury Department, Bureau of Engraving and Printing.....	12
Total.....	729

The laboratory has also continued to collaborate with other nitrogen chemists in studies for the improvement of the present methods of analysis.

SPECIAL RESEARCH WORK.

ANIMAL PHYSIOLOGICAL CHEMISTRY.

The work on the deterioration of meat and fish was continued and extended to include an examination of a large number of inspection samples of liquid and dried eggs and different brands of canned salmon and sardines to determine evidences of deterioration and decomposition. In this connection cooking tests were made on fish and chicken in which fresh specimens and the samples in question were prepared for the table in exactly the same manner and submitted to a committee for an organoleptic test. In all cases the majority of the jurors could detect the aged and inferior product.

Progress has been made in the collection and analysis of the various brands of infant foods now on the market. About 30 different brands have been collected and their analyses partly completed. Feeding experiments on mice and kittens have been conducted with each of the different brands being prepared, for feeding, according to the formulæ prescribed in the accompanying directions. In some cases several modifications have been tried. The data obtained are being collated.

Among the miscellaneous problems referred to this laboratory were the following: A feeding experiment on rabbits, using solutions of different strengths of calcium hyperchlorite, was conducted in collaboration with the water laboratory of the miscellaneous division. This investigation and that of other chemical agents used in the purification of water supplies will be continued during the coming year.

The question of the solubility of the silver coating on candy in the digestive juices was studied. Saliva, artificial gastric juice, and

artificial pancreatic juice were employed. No silver went into solution in any of the experiments.

A number of extracts were examined to determine whether they were of animal or vegetable origin, the differentiation of yeast extract from vegetable or plant extracts forming a part of this study. The identification of importations of canned meat was attempted, especially to determine whether they were composed of beef or of whale meat.

Some work was also done on the determination of glycogen in meat and on the analyses of culture media. The work on the analysis of beef and yeast extracts of known origin was published in circular form. A chart showing the composition of foods used for infant feeding was compiled from the data on hand and from the literature to be used as an exhibit at conventions and societies interested in this subject.

PLANT PHYSIOLOGICAL CHEMISTRY.

The investigations in plant physiological chemistry have consisted, as in previous years, of the study of the influence of environment, in its broadest aspect, upon the character of plant growth, and this laboratory has been occupied to a large extent in carrying on investigations in collaboration with the various offices of the Bureau of Plant Industry.

These collaborative studies are as follows:

(1) The study of the influence of environment on the chemical composition of the various cereals. The field work is under the immediate direction of the office of grain investigations and the chemical work is carried on by this laboratory. The grains under investigation are wheat, rye, oats, barley, buckwheat, emmer, spelts, milo, kafir, durra, etc. The work consists chiefly in growing different varieties of these grains in different localities. In this way it is hoped that valuable results will be obtained. Already thousands of analyses have been made, and a report of the work is in progress. During the past year alone over 600 samples have been received from the office of grain investigations.

(2) The analysis of wheat grown under special conditions of sunshine and shade. The physicist of the Bureau of Plant Industry has direct charge of these experiments. By the use of new and ingenious apparatus it is hoped to be able to determine the action of the solar rays in influencing the composition of wheat.

(3) The continuation of the study of plants grown in the Great Plains area. The office of dry-land agriculture of the Bureau of Plant Industry is conducting an extensive series of experiments on the influence of rotation on crop production and samples are furnished this laboratory for the purpose of determining, if possible, the effect on the chemical composition of the different methods of handling growing crops.

(4) The study of the composition of many varieties of barley grown in the same locality for a series of years. For the past three or four years the experiment station at St. Anthony Park, Minn., has been conducting variety tests of barleys with the cooperation of the Bureau of Plant Industry. Samples have been furnished this laboratory for the purpose of determining the differences in the composition of these

varieties of barley when grown year after year on the same experimental field.

(5) Milling and baking experiments to determine the value of wheat. These are supplemental to the chemical analyses which have been made for a number of years. At the present time an extensive series of milling and baking tests is being conducted, which in connection with the chemical analysis of the wheat will no doubt be of great value, scientifically and technically.

(6) The study of different varieties of potatoes for starch content. The growing of potatoes on an extensive scale would yield greater profits if care were taken to select only those varieties that are heavy yielders and are at the same time rich in starch. The tests made on potatoes were for starch content with a view to the improvement of the varieties that should be grown.

Other investigations made in this laboratory are:

(1) The study of cereals during the first few weeks of their growth and the effect of various plant foods on the composition of young plants. The work heretofore has been done mostly with mature crops or with growing crops after the plants had become well started. This experiment is to determine the changes which take place during the first two weeks of the history of the plant. Wheat seedlings were generally grown because they are easy to grow and manipulate.

(2) The study of the effect of plant food on the formation of roots of young plants. The work just described led to the study of the effect of the reaction of the solution on the root development. It was noticed in the preceding investigation that a marked effect was produced when the seedlings were grown in water culture in the presence of certain salts. This investigation was then undertaken to determine some means of correcting the undesirable effects thus produced.

(3) A study of the use of partial substitutes for flour in the baking of bread, as, for example, cottonseed flour, peanut meal, soy-bean meal, and other high-protein products. A new use for cotton seed has been found, namely, the making of cotton seed flour, containing over 40 per cent protein, as compared with the 12 per cent present in ordinary wheat flour. This cottonseed flour is being extensively used in portions of the South for mixing with wheat flour for the baking of higher protein bread. These investigations will cover not only the use of cottonseed flour in bread making, but the use of other high protein substances as partial substitutes for wheat flour. Such mixtures of course would be sold under their proper names and not as wheat flour.

(4) The study of Graham flours found on the market. The frequent requests of the division of foods for the testing of Graham flours to determine whether they are straight or mixed have led to an investigation which has been conducted by a chemist who is also a milling and baking expert, and the results of the work will be compiled in the near future.

(5) A study of starches from different plants. The experiments conducted this year are preliminary in character and include studies of the chemical and physical properties of starches from different sources and of a means for the more complete extraction of the starch from the tubers than is obtained at the present time.

In making these researches this laboratory has completed between 13,000 and 14,000 determinations of a widely varying character on about 2,000 samples.

PHYSICAL CHEMISTRY.

This laboratory was established in March, 1911, and was charged with "the study, from the physical-chemical point of view, of the action of enzymes." The work which has been completed consists of several researches on the properties and mode of action of the enzyme invertase, which inverts sugar. Preparations of this enzyme are in daily use in this bureau in the analytical estimation of sugar and the results show that the use of this new method gives a more accurate analysis than has been possible heretofore. The influence on invertase of alcohol, acids, and several other substances which occur with sugar in foods and drugs has been studied and the precautions which are necessary in the use of invertase in analysis have been worked out. In another investigation it has been shown that in all probability sugar is not synthesized from invert sugar by invertase, and that the action of this enzyme on sugar gives a complete hydrolysis and not a reversible equilibrium, as has often been believed. These studies open up a most interesting field of research and will be vigorously prosecuted.

ENOLOGICAL CHEMICAL RESEARCH.

The enological chemical investigations are conducted at the main laboratory at Stonehenge, Charlottesville, Va., and at a field laboratory at Sandusky, Ohio. At Charlottesville the regular work comprises:

(1) The study of yeast races and the preparation of desirable pure cultures for practical use.

(2) The preparation of samples of pure wines and ciders of known history for experimental studies on quality and composition.

(3) The critical chemical study of wines and ciders of known origin to determine alterations in the composition during aging and the effect of different methods of storage, and to establish the normal composition of wines made from our native grapes.

(4) Investigations of the chemical composition of commercial samples of American wines; both laboratories take part in this work.

(5) Investigation of chemical composition of American grapes and apples for the purpose of establishing the normal composition of the many varieties grown in the several fruit districts of the country.

(6) A critical study of the methods of analysis of fruit and fermented fruit products, in which the chemists at both laboratories are cooperating.

The field laboratory at Sandusky, Ohio, is occupied chiefly with the following lines of investigation:

(1) The composition of grapes and apples grown in the northern fruit belt, from central New York westward to Michigan.

(2) The preparation of natural wine samples from the important grapes grown in the northern fruit belt.

Yeast cultures for practical use were distributed, on request of persons interested in the manufacture of fruit by-products, to 13 of the chief fruit-growing States during the past year. Twenty-eight

samples of wines from native grapes and three samples of ciders were made for the purpose of studying the chemical composition and quality of these products.

Eighty samples of wines and 25 samples of ciders manufactured by this laboratory are now undergoing chemical study for the determination of technical questions as to their normal composition and the changes which occur in the important constituents of these products during maturity. The chemical work under this head comprised 2,728 determinations at the Stonehenge laboratory the past year. This study is made as exhaustive as the facilities permit, and promises when completed to furnish important data as to the normal constituents of natural wines. Sophisticated wines were also made and studied in like manner. The chemical work on ciders required 480 determinations, and has been so far completed that the fundamental facts are fairly well established, but the work on wines will require further investigation.

Of the commercial wines 133 samples were examined at the Stonehenge laboratory, requiring 2,392 determinations. These were wines made from native American grapes and the data are very important for comparison with the results on the experimental wines.

Sixty grape samples and 28 apple samples were analyzed at the main laboratory, necessitating 936 determinations. At the Sandusky laboratory 583 samples of grapes and by-products from grapes, such as pomace, etc., were handled, 4,664 determinations being made, and 498 samples of apple products were analyzed, necessitating 5,478 determinations.

The total number of determinations made during the year at Stonehenge laboratory was 6,536 and at the Sandusky laboratory 10,142.

During the past year the results on a study of the occurrence of sucrose in native American grapes and on the development of acid and sugar in native grapes during ripening has been published (Bulletin 140), and a report on the chemical composition of American grapes has been compiled. The latter contains the analyses of 100 samples of the leading varieties of American grapes made during the season of 1908; 396 samples analyzed in 1909, and 511 samples analyzed in 1910. The samples include practically all of the varieties grown in the Eastern and Central States, and in the case of the best varieties numerous samples were collected from the more important fruit districts mentioned. The completion of this work will bring together a large amount of data which has not heretofore been available.

INVESTIGATIONS OF THE LEATHER AND PAPER LABORATORY.

LEATHER.

In the research work on leather approximately 100 samples of sole leather have been examined. The results of these examinations, so far as they relate to composition, have been compiled. Approximately 58 per cent of the leathers examined are weighted with glucose, Epsom salts, or both. The weighting contains from 1 to 7.5 per cent

of Epsom salts, and as high as 15 per cent of glucose. The total maximum loading of the two found in any sample was 19 per cent. The average amount of Epsom salts in the weighted leather is 3 per cent, of glucose 8 per cent. The average amount of these adulterants in all weighted leather is approximately 9 per cent. The water-soluble materials in these leathers vary from 13 to 37 per cent. On this basis approximately 125,000,000 pounds of sole leather has been injured and lowered in wearing value by the use of glucose and Epsom salts, and the American public has paid the cost of at least 12,000,000 pounds of these materials, together with the cost of working them into the leather, plus a profit to the tanner for doing it, all to secure a less durable product. Nearly all of the leathers examined contained as much or more uncombined tannin as the best oak or hemlock bark, and the greater part of this tannin is worse than wasted. The weight of the leather is needlessly increased, thereby resulting in increased cost, and, further, the tannin thus wasted would make 40,000,000 pounds of leather. There is urgent need of reform in the tanning of leather, and the public should take immediate steps to protect itself against the fraud and the waste of national resources involved.

PAPER AND PAPER-MAKING MATERIALS.

The work on paper-making materials that are used but little and on improved processes of treatment has been continued with very encouraging results. It has been fully demonstrated that the waste pine wood of the South and Northwest is suitable for the manufacture of certain grades, especially manila wrapping, box boards, and other strong papers. As there are large quantities of this waste wood, its use for this purpose would greatly relieve the pressure on other woods better suited to make white paper. It has been shown that at a moderate estimate the value of the pulp, rosin, turpentine, and rosin oils obtained from a cord of pine wood is more than \$40. The utilization of this waste material in this way is earnestly commended to paper makers and investors, and constitutes one of the most promising fields for industrial development. The results of this investigation have also been compiled.

Cooperative work with the Bureau of Plant Industry in regard to the availability of certain plants as paper-making materials is being continued.

Cooperative work with the Post Office Department is being continued both at Dayton, Ohio, where a special laboratory is maintained for the examination of the stamped-envelope papers, and at Washington.

Numerous requests have been received from the several Federal departments for tests of contract papers, for the preparation of specifications, and for assistance in passing on supplies. Much work has been done at the request of the General Supply Committee, the Bureau of Engraving and Printing, and the Post Office Department. In addition, a member of this laboratory has served on the subcommittee on stationery of the General Supply Committee, and on the envelope committee of the Post Office Department. This committee has made material savings, estimated at approximately \$180,000 in four years, in the cost of envelopes for the departments,

and this saving has been due largely to the adoption of suggestions offered by this laboratory.

TURPENTINE AND ROSIN.

The results of the examination of 300 samples of commercial turpentines, collected all over the country, have been published (Bulletin 135). They show but little adulteration on the part of the producer, while samples collected from dealers show from 13 to 18 per cent of the samples to be adulterated with mineral oils present in amounts varying from 2 to 3 per cent to 60 or 70 per cent. The average amount of mineral oil in a barrel of adulterated turpentine was 3 gallons, equal to a depreciation in value of at least \$1.50 per barrel.

The results of the study of the production, refining, uses, and value of wood turpentine have been compiled (Bulletin 144). The work shows how the number, quality, and value of the products obtained in the distillation of wood can be increased, how the quality of the products may be improved, and the cost of production decreased. Properly refined wood turpentine has been found to be a suitable paint and varnish thinner for all but the highest grade varnishes, and it may be safely used by the workman in well-ventilated places. The production of wood turpentine together with other products of the chemical treatment of waste wood, either by means of destructive processes or by solvent processes, as previously outlined, is one of the most promising chemical industries.

The work on the grading of rosin has now reached the point where the results can be presented. It shows that the misgrading of rosin is largely due to the practice of cutting the grading samples too large, as well as to the fact that the type samples rapidly bleach out, thus becoming lighter in color than they should be. The quantity of rosin which is misgraded from these causes is large, and the loss occasioned thereby is always at the expense of the farmer who produces the rosin. It is calculated on the basis of the work so far done that in the neighborhood of 400,000 barrels of rosin are misgraded annually from the above-mentioned causes alone. Work is being continued on the preparation of more durable and serviceable rosin type samples, with encouraging results.

MISCELLANEOUS WORK.

The work of testing deliveries of paper, textiles, leather, turpentine, rosin, and other materials for the several Federal departments requires much of the time of the laboratory force. Considerable research is required in connection with this work, much useful information has been acquired from it, and several improvements in testing apparatus have been devised. Specifications to insure the delivery of materials suitable for specific purposes have been prepared at the request of other departments.

Miscellaneous samples, including fertilizers, phosphates, wastes, and various industrial materials have been examined at the request of other departments and of other bureaus of this department and the laboratory has cooperated in the study of methods for the examination of leather and tanning materials. An extended study of the fluorin in phosphate powders and of iron and alumina in phosphates is in progress.

The following tabulation shows the number and kind of samples examined in the laboratory during the year. Of these, 2,637 were papers examined at Dayton, Ohio.

Paper and paper-making materials.....	7,092
Textiles.....	1,742
Turpentine and rosin.....	352
Leather and tanning materials.....	40
Miscellaneous.....	217
Total.....	9,443

PUBLICATIONS AND PRINTING.

The following publications have been submitted for printing during the past year: Sixteen bulletins, 23 circulars, 8 unnumbered publications, 1 Farmers' Bulletin, 3 Yearbook articles, 14 Food Inspection Decisions, and 492 Notices of Judgment. There have been issued or sent to press 12 bulletins, aggregating about 1,079 pages, 17 circulars (306 pages); 10 unnumbered publications (339 pages); 3 Farmers' Bulletins (120 pages); 3 Yearbook articles (36 pages); 16 Food Inspection Decisions (30 pages); and 546 Notices of Judgment (1,129 pages, received from the Office of the Solicitor); making a total of 3,039 pages of new material published.

The bulletins included studies on the preparation of cod and other salt fish for the market and the contamination of shellfish; a series of elaborate studies of American mineral waters was begun with the report on the waters of the New England States; a report on the commercial turpentines found on the market; enological studies, dealing especially with grapes and their sucrose content; the processing of persimmons and studies in fruit respirations, and an elaborate report on the nature of coal-tar colors used in foods. The circulars cover a wide range of chemical investigations, many of them being studies for the improvement of methods of food analysis and the making of difficult determinations, as, for example, the estimation of iodine in organic compounds, the determination of tin in canned foods, the determination of small quantities of ethyl or methyl alcohol, of malic acid, of camphor, and chemical and bacteriological changes in poultry under varying conditions. The unnumbered publications included the report of the Chemist, a manual of instructions for food officials and analysts, and details in regard to the inspection of imported meat products under the law.

The Food Inspection Decisions covered Nos. 125 to 138 and included a decision by the Attorney General on labeling whiskies bearing a distinctive name, a decision of the three Secretaries forbidding the use of saccharin in foods after January 1, 1912, and decisions of the Board of Food and Drug Inspection in regard to the labeling of cordials, New Orleans molasses, and chocolate and cocoa, the composition of evaporated milk, the presence of salts of tin in foods, etc.

While the amount of job printing required for the work of the bureau, especially forms, index cards, circular letters, etc., in connection with the administration of the food law, has increased, the ordering has been so systematized that only 208 printing requests were made, as compared with 346 the preceding year. There were 146 requests drawn on the Division of Publications for drafting and photo-

graphic work in connection with the illustrating of bulletins and the ordering of apparatus and other equipment.

CLERICAL AND BUSINESS OPERATIONS.

The total appropriation for the Bureau of Chemistry for the fiscal year ending June 30, 1911, was \$985,700, of which amount \$702,340 was for the enforcement of the food and drugs act, \$109,000 was for studies in the application of chemistry to agriculture and for collaboration with other departments, \$5,000 was for investigating the character of the chemical and physical tests which are applied to American food products in foreign countries and for inspecting the same before shipment, and \$79,360 was for statutory salaries.

A total of 130,000 letters was written to approximately 24,896 correspondents; 64,700 letters were received, filed, and indexed; 88,350 mimeograph letters were sent out, treating of 446 subjects; 2,468 purchase orders were drawn for current supplies for the offices and laboratories; 9,500 vouchers were checked and passed to the disbursing officer of the department for payment; 800 letters of authorization were issued to the members of this bureau; 5,955 manufacturer's or dealer's guarantees under the food and drugs act were received, examined, filed, and serial numbers assigned thereto. In the interstate office complete records were kept of the collection, analysis, and disposition of all samples collected under the food and drugs act, as well as the development, progress, and disposition of each seizure and case based on a violation of the law. These records are complex and involve a vast mass of detail. Verbatim reports of all hearings before the Board of Food and Drug Inspection were made. In addition, complete records were kept of the analysis and action on all import cases under the food and drugs act.

THE PRINCIPAL PROJECTS PLANNED FOR THE FISCAL YEAR 1911-12.

INSPECTION WORK.

The greater portion of the coming fiscal year will be devoted to the collection of official samples of foods and drugs for analysis; to the close scrutiny of factories and conditions attending the production of such products; and to the interstate movement in adulterated or misbranded goods for the purpose of suppressing traffic therein. Inspection work will be carried on in cooperation with the scientific divisions of the bureau along the lines of investigation which may be planned by each division. One of the new subjects to be taken up during the coming year will be the investigation of the colors used in food products, the practice of drying fish and artificially coloring the same to give the semblance of thoroughly dried or cured fish being one phase of the subject to be investigated. The inspection of the milk supply furnished cities will be continued, as will also the close scrutiny of flour and cereals, dairy products, sirups, coffees, eggs, vinegars, etc.

The collection of official samples of so-called patent or proprietary medicines, many of which have in past years been declared by the courts to be misbranded, will be abandoned in view of a recent adverse

decision rendered by the Supreme Court of the United States, holding that any statement or expression of opinion relative to the curative or healing qualities of such nostrums could not be considered a misbranding within the meaning of the law. Attention will be devoted, however, to the investigation of the character of crude drugs, pharmaceuticals, and preparations to ascertain whether they comply with the standards of purity and strength required by the United States Pharmacopœia and by the published formulas of the manufacturers. Attention will also be given to the investigation of other drug products which may be required from time to time by the drug division.

It has been impossible heretofore to give any attention to inspection work outside of the confines of the United States, but plans have already been laid and the necessary steps taken to begin a vigorous and thorough inspection of the food and drug supplies shipped to Alaska, as well as those which may be produced or manufactured there. Because of the climatic conditions, the season for prosecuting this work will necessarily be of short duration, and the force is not strong enough numerically to permit a force of inspectors to be detailed for this work, but at the same time it is hoped to accomplish something toward correcting any violations of the law which may exist in that Territory.

DRUG WORK.

The work planned for the coming year consists primarily in the examination of domestic and imported drugs and the preparation of cases based upon interstate shipments found to be misbranded or adulterated. The drug work at the branch laboratories will be extended as rapidly as possible. Special investigations of analytical processes will be continued for the separation, detection, and determination of alkaloids and other plant constituents contained in medicinal products. The effects of prolonged storage on the active principles contained in medicinal agents now under investigation will be continued.

Further studies will be made for the improvement of methods for the detection and determination of opium and constituents thereof contained in medicinal agents, and of the analytical processes for the detection and estimation of such constituents as ether, ethyl alcohol, and chloroform, so frequently found in complex mixtures. It is also planned to extend the investigations covering cooperative work on test mixtures of therapeutic drugs, in particular those containing synthetic morphin derivatives, heroin, codein, etc.; substitutes for cocain, such as novacocain, eucain, alypin, etc.; natural and synthetic laxatives belonging or closely related to the emodin group. Some interesting results have already been obtained in attempts to estimate minute quantities of chloroform in complex mixtures, and further investigations along this line are contemplated for the ensuing year.

SPECIAL FOOD INVESTIGATIONS.

The examination of interstate and imported samples of foods and drugs in connection with the enforcement of the food and drugs act will continue to occupy the greater part of the time of Food and Drug

Divisions and the inspection laboratories, as well as of other laboratories, such as the bacteriological and microchemical, dairy, sugar, water, and cattle-feed laboratories, where these special subjects are handled. The executive work in connection with the assignment and checking of these investigations, and the preparation of recommendations in regard to the findings, continue to grow in volume and complicated problems are constantly arising which can only be met by extensive investigations. The following are among the special investigations to be made during this year:

The detection and estimation of decayed stock used in fruit and vegetable products will be studied in the chemical, bacteriological, and microchemical laboratories from the several points of view, and supplemented by factory experiments and inspection. The deterioration of fish and especially of canned sardines and salmon will also be investigated.

The presence of coal-tar dyes in food products of all kinds, especially with reference to their contamination with deleterious ingredients and to determine whether certified colors have been used, will form an important line of work. Methods of detection will be further elaborated and the application of the spectroscope to this work be studied.

The investigation of cider vinegar and its adulterants, the composition of spices and materials used in their sophistication, and the study of extracts and essential oils used in their preparation such as peppermint, wintergreen, and nutmeg, for the purpose of elaborating methods that will enable the detection of the most carefully prepared imitations, will all be continued.

Among other miscellaneous food investigations which are to receive special attention are the work on infant foods, including physiological and chemical studies of commercial preparations and modifications of the same; the composition of the common fruits and vegetables in the fresh condition, changes in composition of domestic and imported rice; wheat flours, edible gelatins, and such other studies as may be called for by the exigencies of the inspection work.

A new food and drug inspection laboratory is to be established at San Juan, P. R., during this year for the more efficient protection of the supplies of that territory.

FIELD INVESTIGATIONS AND RESEARCHES ON POULTRY AND EGGS.

The plans of the Food Research Laboratory include further studies, especially during the heated term, of poultry chilled in water and in cold air and shipped in ice or dry packed. The deep-seated changes that the flesh undergoes when chilled by these different methods will be more carefully and fully studied, certain preliminary results having already been obtained along that line.

The effect of temperature on flesh decomposition will be studied, more attention now being given to individual phases of the subject, such as the effect of long-continued cold on enzymes; the effect of cold applied after retrograde changes have begun; the effect of ordinary temperatures applied after long-continued cold, etc.; all these questions having already been submitted to preliminary work. Such subjects must necessarily look chiefly to the laboratory for solution, yet without the field station to provide samples of known history and to make observations concerning environment, the scientific results

would lose much of their value. Especially is this true in the study of eggs, where it is absolutely necessary that the history be known if accurate conclusions are to be drawn. The study of individual eggs and of classes of eggs as determined by the candle will be pushed, that the system of candling may be put on a more accurate and scientific foundation. The ability of certain eggs to carry, store, and stand the vicissitudes of marketing generally will continue to be investigated. Efforts at the producing center and at the receiving center to inculcate better methods of handling to prevent loss and deterioration will not be abated.

The investigation of frozen and dried eggs and egg products, which began as a cooperative study with the industry for the betterment of the product during the very last of the fiscal year 1910-11, will be pushed as rapidly as possible until the close of the egg-breaking season of 1911 and, if the results warrant, will be continued just as soon as the spring season of 1912 opens. In this investigation every effort is being made to obtain the facts concerning present procedures and customs, and to use every endeavor possible to establish routine, commercially practical methods which will enable the industry to furnish a uniformly wholesome product and save many millions of eggs that are wasted now each year because of a lack of knowledge of the subject. The scope of the research will be as wide as possible. All kinds and sorts of eggs used by the breakers, individually and collectively, will be studied bacterially and chemically. Every stage of the industrial procedure, as practiced by the various egg-breaking establishments which can be reached from the laboratory headquarters—Omaha at present—will be tested and retested. Where the acquisition of knowledge indicates points to be improved and methods for doing it, the results will at once be given to the breaker that no time may be lost in attaining the desired end. Meanwhile laboratory experiments in breaking and collecting just such eggs as the industry uses will serve as a check on commercial work and also indicate what can be accomplished by clean handling while the carrying of these same methods into the egg-breaking establishment, and the putting up of packages side by side with the regular laborers, will decide not only the efficiency but the practicality of the methods as well. An endeavor will be made during the coming year to hold more meetings and demonstrations where a number of practical poultry and egg men can be gathered together. Many of the men are urging this, and they offer their services in spreading information concerning the work of the laboratory and in collecting the industry at the appointed time and place of the meeting.

ENOLOGICAL STUDIES.

(1) The critical chemical study of wines and ciders made in the enological laboratory and the preparation of additional samples for the further study of the normal composition of these products.

(2) Experiments on reducing the acid content of wines by cellar practices.

(3) The chemical examination of pomaces from wine, cider, and juice factories with a view to saving such wastes as often occur.

(4) Installation of apparatus for a study of generation of vinegars, especially as to the use of waste products and the study of the chemical changes which occur in the manufacture of fruit vinegar.

(5) Continuation of the studies on the chemical composition of grapes and apples.

(6) Continuation of the studies on yeast races and their practical use in the factory work.

SUGAR INVESTIGATIONS.

The completion of the extensive investigation under way in regard to the maple-sugar industry will be made the most important work of the year 1912, together with the completion of the study of the moisture content of cane sirup and molasses and the work on imported honey. Preparatory work will be done looking toward as thorough an investigation of the sorghum and cane sirup industries as has been made in the case of maple products. The environment studies on the sugar content of watermelons and muskmelons will be steadily advanced.

PLANT PHYSIOLOGICAL STUDIES.

Among the principal plant physiological studies may be enumerated the following:

(1) The milling of wheats and the baking of the resultant flour in order to determine their value for bread making.

(2) The chemical study of mill products.

(3) The investigation of graham flours on the market.

(4) The study of the composition of leaves of various trees at different stages of development, for the purpose of determining their value for agricultural uses.

(5) The study of milling products from rice.

(6) Starch investigations for the purpose of determining whether it is more practicable to extract the starch from potatoes and other starch-bearing plants, when reduced to a dry condition and then ground, than it is by grinding the fresh tubers and extracting the starch, as is being done at the present time.

PHYSICAL CHEMICAL PROBLEMS.

Investigations on the following subjects are in progress in the physical chemistry laboratory: (1) The preparation of invertase from waste brewers' yeast and a further study of the laws of its action; (2) the economical preparation of raffinose from cottonseed meal and a study of its hydrolysis by invertase; (3) the quantitative estimation of cane sugar, particularly in agricultural and food products, by the use of invertase.

WORK OF THE MISCELLANEOUS DIVISION.

WATER.

The survey of the important mineral springs of the United States, which includes a very comprehensive analysis of the water from source, will be continued as heretofore. The examination of foreign and domestic waters to determine whether or not they are properly labeled under the food and drugs act will be continued. Improved methods of mineral-water analysis will be studied and the radio-activity of certain mineral-waters determined, the latter investigation

applying especially to samples coming directly from source. Improved methods for the determination of the several sulphur compounds in sulphur waters will be given especial attention and certain chemicals used in the purification of water for potable and technical purposes will be studied. Irrigation and drainage waters and methods of analysis especially applicable to them will furnish another line of investigation.

INSECTICIDES AND FUNGICIDES

In addition to the examination of insecticides and fungicides and the carrying out of analyses in connection with chemical problems relating thereto, as called for by other bureaus of the department, the following work and investigations will be prosecuted: (1) Analyses of insecticides for the Insecticide and Fungicide Board in connection with the enforcement of the insecticide act of 1910; (2) the study of the cause of injury to foliage of fruit trees by lead arsenate and methods for preventing this injury; (3) orchard and laboratory tests of poisonous compounds not at present used as insecticides, with the view to finding some substance which may be so used on peach and other tender foliage; (4) the supposed injury to fruit trees from the accumulation of toxic salts in the soil, due to the use of insecticides, in cooperation with the Bureau of Entomology; (5) the arsenic and copper content of fruit to which materials containing these substances have been applied in spraying operations.

CATTLE FEEDS, ETC.

The examination of the cattle and poultry feeds entering interstate commerce, also a study of range forage crops, in cooperation with the Bureau of Plant Industry, will be continued. There will be, as usual, considerable miscellaneous work for the various bureaus and departments of the Government to assist them in solving problems relating to the analyses, feeding value, commercial importance, etc., of grains and other feeding stuffs. It is planned to adapt a chemical method for the measurement of the deterioration of corn by-products, such as hominy feed, corn bran, etc., caused by mold, heating, etc.; also to make a chemical examination of the Osage orange, considered as a feedstuff. The methods used in determining the various constituents of cattle foods will be studied, and, if possible, the constituents of the ether extract of such feeding stuffs as alfalfa, grasses, and other materials, whose ether extract contains large quantities of substances other than fat, will be examined.

SMELTER WASTES, ETC.

The effect of smelter waste on animal and vegetable life will be continued if such work is requested by the Department of Justice. Investigations relative to the sulphur trioxid content of foliage, which is killed otherwise than by smelters, will also be continued. If time permits, the effect of various trade wastes on vegetation and animals will be studied. Sanitary studies relative to poisonous substances in household articles and articles of food will be continued as heretofore.

CONTRACTS LABORATORY.

The greater part of the work of this laboratory will probably consist in the testing of miscellaneous materials purchased under contract by the Government departments, and the preparation and revision of specifications for such materials. The study of paint and paint materials and the investigations of enamel-ware cooking utensils and rubber and platinum laboratory utensils will be continued.

LEATHER AND PAPER LABORATORY.

It is proposed to pursue the following lines of work during the coming year:

(1) The study of unusual paper-making materials, method of cooking stock, and methods for the utilization and disposal of the wastes of paper making.

(2) Studies of the service, quality, and suitability of leather for various purposes, and experiments to improve its quality with a view to conserving raw material. An investigation of the weighting of leather, and other harmful or needless processes of leather making to improve methods of manufacture and reduce its cost. The study of native tanning materials, with particular attention to their conservation.

(3) Studies on the production, refining, nature, and uses of wood turpentine and of other products obtained by chemical methods from wood. Investigations looking to the improvement of the quality and quantity of rosin; methods of grading the same by the establishment of types. Testing of turpentine and rosin for adulterants under the food and drugs act.

(4) The testing of leather, turpentine, rosin, paper, and the preparation of specifications therefor for other departments of the Government upon their request.

REPORT OF THE CHIEF OF THE BUREAU OF SOILS.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., September 16, 1911.

SIR: I have the honor to transmit herewith a report covering the operations of the Bureau of Soils for the fiscal year ended June 30, 1911.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

PROGRESS OF THE SOIL SURVEY.

THE YEAR'S WORK.

The area surveyed and mapped during the past fiscal year was 95,420 square miles, or 61,068,800 acres. Of this area 25,096 square miles, or 16,061,440 acres, was covered by detailed surveys and 70,324 square miles, or 45,007,360 acres, by reconnoissance surveys. This work was carried on in 60 areas distributed through 21 States. In 11 of these States the field work was conducted in cooperation with State authorities, who contributed approximately an equal share with the Bureau of Soils toward the cost of the work. In the remaining 10 States there was no State cooperation, the expense of the work being borne entirely by the bureau.

The following tables show the areas surveyed during the last fiscal year and the total area surveyed in each State up to the present time:

Individual areas surveyed and mapped during the fiscal year ended June 30, 1911.

DETAILED.

State or Territory.	Area.	Area surveyed.	
		Square miles.	Acres.
Alabama.....	Jackson County.....	¹ 888	568,320
	Mobile County.....	¹ 511	327,040
	Pike County.....	¹ 329	210,560
	Randolph County.....	579	370,560
	Tuscaloosa County.....	¹ 1,040	665,600
California.....	Fresno area.....	983	629,120
	Redbluff area.....	325	208,000

¹ This figure does not include portions of this area surveyed in preceding years.

Individual areas surveyed and mapped during the fiscal year ended June 30, 1911—Continued.

DETAILED—Continued.

State or Territory.	Area.	Area surveyed.	
		Square miles.	Acres.
Colorado.....	Uncompahgre Valley area.....	381	243,840
Connecticut.....	Windham County.....	515	329,600
Georgia.....	Chatham County.....	508	325,120
	Columbia County.....	306	195,840
	Glynn County.....	468	299,520
	Walker County.....	434	277,760
Kansas.....	Reno County.....	100	64,000
Kentucky.....	Rockcastle County.....	¹ 134	85,760
Louisiana.....	Iberia Parish.....	583	373,120
Massachusetts.....	Plymouth County.....	342	218,880
Mississippi.....	Forrest County.....	468	299,520
	Lauderdale County.....	708	453,120
	Lowndes County.....	530	339,200
	Wayne County.....	321	205,440
Missouri.....	Cape Girardeau County.....	574	367,360
	Jackson County.....	¹ 432	276,480
	Macon County.....	271	173,440
	Marion County.....	¹ 332	212,480
	Pemiscot County.....	488	312,320
	Platte County.....	310	198,400
New Jersey.....	Sussex area.....	¹ 433	277,120
New York.....	Jefferson County.....	170	108,800
	Monroe County.....	643	411,520
	Ontario County.....	¹ 83	53,120
North Carolina.....	Cabarrus County.....	368	235,520
	Granville County.....	¹ 322	206,080
	Johnston County.....	238	152,320
	Mecklenburg County.....	¹ 198	126,720
	Richmond County.....	500	320,000
Oregon.....	Rogue River Valley area.....	262	167,680
Pennsylvania.....	Bedford County.....	590	377,600
	Bradford County.....	¹ 577	369,280
	Erie County.....	785	502,400
	Washington County.....	890	569,600
	York County.....	117	74,880
South Carolina.....	Fairfield County.....	776	496,640
	Georgetown County.....	827	529,280
Texas.....	Harrison County.....	340	217,600
West Virginia.....	Clarksburg area.....	800	512,000
	Morgantown area.....	217	138,880
Wisconsin.....	Point Pleasant area.....	¹ 268	811,520
	Fond du Lac County.....	720	460,800
	Juneau County.....	335	214,400
	Kewaunee County.....	150	96,000
	La Crosse County.....	475	304,000
	Waukesha County.....	¹ 152	97,280
	Total.....	25,096	16,061,440

RECONNOISSANCE.

Kansas.....	Western area.....	39,960	25,574,400
Pennsylvania.....	Northeastern area.....	2,080	1,331,200
	South central area.....	¹ 6,670	4,268,800
Texas.....	Central southwestern area.....	16,263	10,408,320
	Panhandle area.....	¹ 1,088	696,320
Washington.....	Quincy area.....	¹ 1,050	* 691,200
	Western Puget Sound.....	¹ 3,183	2,037,120
	Total.....	70,324	45,007,360

¹ This figure does not include portions of this area surveyed in preceding years.

Total areas surveyed and mapped in the several States during the fiscal year ended June 30, 1911, and the areas previously reported.

DETAILED.

State or Territory.	Work during 1911.	Work previously reported.	Total.	
	<i>Sq. miles.</i>	<i>Sq. miles.</i>	<i>Sq. miles.</i>	<i>Acres.</i>
Alabama.....	3,347	22,592	25,939	16,600,960
Arizona.....		611	611	391,040
Arkansas.....		2,677	2,677	1,713,280
California.....	1,308	11,256	12,564	8,040,960
Colorado.....	381	2,428	2,809	1,797,760
Connecticut.....	515	518	1,033	661,120
Delaware.....		314	314	200,960
Florida.....		3,723	3,723	2,382,720
Georgia.....	1,716	6,150	7,866	5,034,240
Idaho.....		1,281	1,281	819,840
Illinois.....		5,925	5,925	3,792,000
Indiana.....		4,204	4,204	2,690,560
Iowa.....		2,303	2,303	1,473,920
Kansas.....	100	3,175	3,275	2,096,000
Kentucky.....	134	2,210	2,344	1,500,160
Louisiana.....	583	8,173	8,756	5,603,840
Maine.....		939	939	600,960
Maryland.....		4,000	4,000	2,598,400
Massachusetts.....	342	796	1,138	728,320
Michigan.....		4,360	4,360	2,790,400
Minnesota.....		2,713	2,713	1,736,320
Mississippi.....	2,027	8,942	10,969	7,020,160
Missouri.....	2,407	7,769	10,176	6,512,640
Montana.....		432	432	276,480
Nebraska.....		3,116	3,116	1,994,240
Nevada.....		235	235	150,400
New Hampshire.....		1,411	1,411	903,040
New Jersey.....	433	1,643	2,076	1,328,640
New Mexico.....		129	129	82,560
New York.....	896	8,047	8,943	5,723,520
North Carolina.....	1,626	11,732	13,358	8,549,120
North Dakota.....		6,031	6,031	3,859,840
Ohio.....		4,580	4,580	2,931,200
Oklahoma.....		1,160	1,160	742,400
Oregon.....	262	1,195	1,457	932,480
Pennsylvania.....	2,959	5,886	8,845	5,660,800
Porto Rico.....		330	330	211,200
Rhode Island.....		1,085	1,085	694,400
South Carolina.....	1,603	8,710	10,313	6,600,320
South Dakota.....		675	675	432,000
Tennessee.....		6,137	6,137	3,927,680
Texas.....	340	16,171	16,511	10,567,040
Utah.....		1,501	1,501	960,640
Vermont.....		227	227	145,280
Virginia.....		6,437	6,437	4,119,680
Washington.....		1,652	1,652	1,057,280
West Virginia.....	2,285	3,644	5,929	3,794,560
Wisconsin.....	1,832	4,682	6,514	4,168,960
Wyoming.....		309	309	197,760
Total.....	25,096	204,276	229,372	146,798,080

RECONNOISSANCE.

Kansas.....	39,960		39,960	25,574,400
North Dakota.....		39,240	39,240	25,113,600
Pennsylvania.....	8,750	16,633	25,383	16,245,120
South Dakota.....		41,400	41,400	26,496,000
Texas.....	17,351	51,946	69,297	44,350,080
Washington.....	4,263	4,673	8,936	5,719,040
Wisconsin.....		1,396	1,396	893,440
Total.....	70,324	155,288	225,612	144,391,680

COOPERATION.

Active cooperation usually consists of an agreement whereby the Bureau of Soils furnishes an expert soil man and the cooperating organization an assistant, each organization paying the salary and expenses of its employee. This cooperation in soil-survey work is particularly close in the following States: Alabama, Kansas, Mississippi, Missouri, New Jersey, New York, North Carolina, Pennsylvania, Washington, West Virginia, and Wisconsin, and there has been an increasing disposition on the part of the various organizations to request that the Bureau of Soils should enter into some form of active cooperation with them in the prosecution of soil-survey work in the States of Florida, Georgia, Indiana, Massachusetts, Minnesota, North Dakota, Oregon, and Tennessee. Through these cooperative arrangements the progress of the soil-survey work is accelerated and experts are furnished by the Bureau of Soils, who train the State assistants. The facilities of the bureau for the inspection and correlation of the work are made available to local organizations and thus uniformity of methods and results are secured.

This cooperative soil-survey work has been very useful to the bureau in bringing to our aid and assistance men having a thorough knowledge of local conditions, and it has been of assistance to the States in bringing to them the aid of men who have a wider and more extensive knowledge of national conditions, or, in other words, of soil conditions beyond the borders of the State.

This cooperative work should be encouraged and more funds should be made available to meet the increasing demands for its extension. At the same time it must not be forgotten that there are over 30 States that are not cooperating in which there is a very strong demand from citizens and associations for knowledge regarding their soil resources, and from the Federal viewpoint it is just as important to study the soil resources and map the soils in these States as it is in States where cooperation can be arranged. Additional funds are greatly needed for the extension of soil-survey work in the non-cooperating States.

SOIL RESOURCES OF THE COUNTRY.

With an area of over 500,000 square miles surveyed and the wide distribution of the individual projects it has been possible during the past year to prepare a bulletin of nearly 300 pages, showing the soil resources and the use of soils east of the Great Plains, while at the close of the present field season we will have completed a reconnaissance survey of the eastern half of the Great Plains region, extending from Canada to the Gulf of Mexico, with the exception of an area in central Texas. It is possible from this work to make a fairly accurate estimate of the entire soil resources of the eastern two-thirds of the United States. This is being followed up by the preparation of a series of publications giving detailed descriptions and setting forth the use, limitations, and possibilities of the important soil types of the country.

THE SCOPE OF APPLICATION OF THE SOIL SURVEYS.

The scientific classification of soils as given in the soil-survey reports and the accompanying maps has a many-sided value to different classes of people and business associations and forms a funda-

mental basis for all other agricultural investigations. The reports describe the origin, mode of formation, and physiographic features of the soils, and discuss their physical and chemical characteristics, fertility factors and manurial requirements, their adaptation to crops and to rotation, and the methods of management required to achieve the best results in cultivation.

These reports are now extensively used by the following interests, and are being more used and more fully appreciated with extension and better understanding of the work:

EXPERIMENT STATIONS, UNIVERSITIES, AGRICULTURAL SCHOOLS, AND
STATE OFFICIALS.

The soil surveys, giving as they do the orderly arrangement and classification of the soils of the State, are of value to the experiment stations in giving a soil-type basis for investigations of the fertilizer requirement, crop rotation, crop adaptation, plant breeding, plant diseases, and soil management of particular farms or of large areas in any particular State, for the establishment of substations on important soil types, and for farm demonstration work.

They are of value to the State geological surveys, as the mapping of the material (the soil) assists them in their work of mapping according to age, especially where rock exposures or fossils are not freely disclosed. The soil is one of the principal economic expressions of the geological work, the soil material being the resultant of geological processes acting on geological material. Furthermore, soil characteristics are frequently very valuable evidence of geological processes or conditions of great importance for other geoeconomic problems.

The soil surveys are of value to the State departments of agriculture, in that they enable a more intelligent collection of statistical data relating to the present status of farming interests and to the possibility of future development of agriculture along safe and rational lines.

The soil surveys are of value to the university and agricultural school as a basis of instruction in agriculture, in commercial geography, in political and social economy, and in geology, physics, and agricultural chemistry.

The maps are of value and are being used by State officials in colonization work and in some States as a basis for the fixation of land values for just taxation.

GOVERNMENT DEPARTMENTS AND FEDERAL OFFICIALS.

The soil surveys are of value to the War Department in arranging for camp sites and for military maneuvers.

To the Reclamation Service in construction work and in the use and disposal of the lands of the irrigation projects when completed.

To the Land Office for the determination of the agricultural value of lands.

To the Forest Service for the same purpose, and for determining what lands to devote to permanent forest use and the varieties of trees adapted to the soil types.

To the Bureau of Animal Industry in tick eradication and dairy work.

To the Bureau of Plant Industry in plant breeding, disease, farm management, and demonstration work.

To the Post Office Department in the location of rural delivery routes.

To the Department of Justice and the courts in cases arising out of damage suits and in mineral-land cases.

BOARDS OF TRADE, MUNICIPAL AUTHORITIES, AND BUSINESS ORGANIZATIONS.

Such local organizations frequently ask for and use the results of the soil surveys for the encouragement of more profitable agricultural development of the surrounding territory and as a means of attracting a desirable class of farmers and farm labor for the up-building of agriculture and the betterment of trade conditions.

RAILWAYS, REAL-ESTATE COMPANIES, AND COLONIZATION ORGANIZATIONS.

The soil surveys are of value to railroads in giving reliable and impartial information with regard to the soils and agricultural possibilities of the territory through which the lines run; in showing them lines of agricultural development which they can foster for the fuller development of the country and the increase of their own revenues.

The surveys are of value to real estate companies in that they give an impartial and authoritative basis for dealing in lands, which can be obtained in no other way. They tend to steady business and prevent unjust and unlawful speculation.

The surveys are of value to colonization organizations, as well as to the railways, in furnishing exact and reliable bases for the intelligent settlement of communities, particularly in placing the large number of farmers reaching our shores from foreign countries through the Immigration Service. These people are particularly in need of reliable information regarding localities where they can settle and take up agricultural industries with which they are reasonably familiar. The farmers of southern Italy, of northern Italy, of France, Germany, Sweden, Holland, Ireland, and other countries have certain traits and characteristics and have acquired habits and adaptabilities which can be successfully applied to certain soil types and certain conditions, and are likely to be unsuccessful unless these conditions are approximately fulfilled.

BANKS, INSURANCE COMPANIES, ATTORNEYS, AND OTHERS INTERESTED IN LOCAL VALUES.

The soil surveys are of value to financial institutions in that they give reliable and impartial information as to the soil and agricultural opportunities of the areas surveyed. Several real estate companies have reported that purchasers invariably require to know the location on the soil map of the farms which are offered to them for sale. In the same way financial institutions free to loan money on mortgages

and for agricultural enterprises use the reports of the soil survey as they would use the reports of mining experts as to the value of mining properties for which a loan is desired. In other words, the report of the soil survey has a commercial value in that the owner of the land can more readily raise money on mortgages and a financial institution can more safely loan money on mortgages on the basis of the soil survey than on any other data that can be obtained.

GRANGES, PRACTICAL AGRICULTURISTS, AND AGRICULTURAL FIRMS.

The soil surveys are of value to the farmer in many ways. They give him first of all an accurate and impartial description of his soils, thus enabling a direct comparison with the soils of other localities. They show what may be expected of the soils when intelligently cultivated, the proper crops to plant, and the possibilities of adopting on their farms crops and methods of culture that have been successfully inaugurated in other localities with similar soils. They give him an advantage in dealing with other individuals and with real estate companies in the sale of his land. They give him and his sons the advantage of more specific training in the agricultural schools and universities. They give him certain advantages of knowledge in purchasing lands from real estate agents. They give him a basis for consideration from the railroads and business organizations, which consideration is often required in the building up of new agricultural enterprises. They give him an advantage in dealing with financial institutions in securing loans, and finally they aid him in securing more intelligent and more competent labor. The surveys are also invaluable for anyone selecting a farm in a locality with which he is not personally acquainted.

The soil survey is of value to agricultural firms in that it gives them a basis for the supply of the proper kind of implements, seeds, and fertilizers.

PHYSICAL AND CHEMICAL LABORATORY INVESTIGATIONS.

As is usual, the laboratories have made a large number of physical, chemical, and mineralogical analyses. This work has been done not only for other divisions of the Bureau of Soils, but also for other bureaus and departments, and, under certain restrictions, for the public at large. It has included the analysis of muck soils in connection with the reclamation of marsh lands in the East and the analysis of local soils and waters in connection with drainage, irrigation, and reclamation in the West. Special attention has been given to mineralogical and physical methods of soil analysis. The mineralogical methods developed in this division have proven so valuable that a bulletin is being prepared describing the application of these methods to soil investigation. A mineralogical examination has been made and the physical characteristics determined of a number of important soil types of this country. A similar work has been done in connection with a number of dune sands from the West, with the object of explaining the formation of certain wind-borne sediments of the plains.

Special attention has been given to work on the differences that exist between normal soils or soils that, subject to the ordinary

methods of analysis, appear to be similar in every way, but which differ markedly in their normal relations to crops and to crop adaptation. When subjected to a careful mineralogical examination such soils frequently show marked differences in mineral composition. Important results along this line have been obtained in a work involving the complete analyses of widely distributed and important soil types. These were selected to represent soils of various origins in respect to the materials from which they were formed and with respect to the processes of formation. Special attention has also been given to substances present in small quantity, such as are always ignored in soil analyses, a consideration of which may show differences in composition of soils hitherto assumed to be chemically alike. The vegetable life which a soil supports is known to contain a large number of elements that are ordinarily not considered essential to its growth, and since it has been found that a small amount of arsenic is necessary for the proper functioning of certain animal tissues, it seems probable that other elements besides the few which have heretofore been assumed to be the only essential ones, although present in very small quantities in the soil or in the plant, may be equally essential to plants or regulate in some essential way the functioning of the soil. The presence or absence of these rarer elements in the soil and their proper correlation to plant growth are, therefore, of great importance. This work has no parallel in all previous analyses of soils.

Experiments have been carried on to determine the effect of soluble salts on the physical properties of soils. It has been shown that the effects of such salts in soils on the penetrability, volume change, moisture, and vapor pressure of the soil solution are measurable and larger than generally supposed. A bulletin has been prepared indicating these results. In view of the lack of precise treatment of the surface-action factors in modern literature on soils, agricultural chemistry, bacteriology, biology, and cognate sciences, a thorough study of the fundamental, mathematical treatises extant was undertaken with the object of attempting a condensed correlation of these factors.

The work on flocculation and sedimentation has been continued. A detailed study of tillage has been made with the object of preparing for publication a bulletin on tillage methods. A very large number of mechanical analyses carried out in this laboratory has made it possible to get data for a bulletin discussing the distribution of silt and clay particles between soils and subsoils. It has been shown that in humid regions the subsoils are, in a large majority of cases, heavier than the soils, and the reverse is true in the arid regions. This is due to the fact that in the humid regions the run-off carries the finer particles with it and the cut-off also carries them down.

Previous studies on the absorption of nutrient salts by soils and soil materials have been continued. It has been found that phosphates which had been absorbed by soils and other finely divided minerals, such as quartz, can be released from the absorbed state and obtained in solution by the addition of various dissolved salts, such as sodium nitrate, potassium nitrate, potassium chloride, potassium carbonate, etc. The fact that phosphate held in a condition not easily

leached by water may be still further extracted when other salts are added in solution in water has an important bearing upon the theory and practice of plant growth and soil treatment in that the effects produced by the addition of, for example, a nitrate may not be due only to nitrate itself, a portion of the beneficial effect being due to liberated phosphate.

In connection with the work on fertilizers and fertilizer materials which the division has undertaken, a thorough study has been made of the phosphate deposits of Tennessee, Arkansas, and Kentucky. The values of the different types of phosphate rock found in the same and in different places have been properly correlated by a large number of analyses. The methods of mining, the extent of the operations, the cost of production, and the future outlook for the industry have been carefully investigated and described. The information thus acquired, combined with that already published by the bureau, constitutes a very valuable addition to our knowledge concerning the phosphate deposits of this country. A crystallographic and photographic study of the minerals *spodiosite*, *brushite*, *monetite*, and artificial calcium phosphate compounds has been undertaken, with the object of throwing light on the natural formation of these minerals. An investigation of the Otero Basin of New Mexico has been made for possible deposits of potassium salts, and a large amount of information acquired which will be of use in extending the work to other parts of the country.

In collaboration with the United States Geological Survey, an examination has been made of 17 salt-producing plants distributed through central New York, Michigan, and Pennsylvania, for the purpose of obtaining information concerning the source of brines and lake salt, their composition with special reference to their potash content, and their treatment. All information thus obtained bears on the problem of the occurrence of potash in brines and lake salts and its possible extraction therefrom. With the same object in view, a study is being made of the separation of potassium chlorides and sulphates of calcium, magnesium, and sodium, the solubility of sodium and potassium sulphate in the presence of each other, and the separation of potassium and sodium salts by other methods.

Work is being done on possible methods of separating potash from feldspar and other silicates, and an investigation is also being made concerning the chemical fixation of atmospheric nitrogen, both from a scientific and technical standpoint. This work constitutes an economic examination of the available sources of nitrogen for agricultural purposes and is cognate with the work on phosphates and potash. A survey of the occurrence of and distribution of potash-bearing algæ on the American coast has been started with particular reference to their utilization as a source of potash supply. This work on fertilizers and fertilizer materials has very large economic possibilities to the American people.

SOIL FERTILITY INVESTIGATIONS.

There have appeared a number of reports from this laboratory dealing with the nature and properties of soil organic matter or humus, and in connection with these problems some far-reaching discoveries have been made in soil investigations. During the past year

these researches have led to the discovery of organic soil constituents decidedly beneficial to growing crops. It has been demonstrated that one, a nitrogenous constituent, creatinine, exists in soils, exists in manures, and exists in many plants and seeds, whereas it was hitherto recognized only in connection with products of animal origin; that it is beneficial to crops, and that it is able to replace nitrates in aiding plant growth.

The facts demonstrated by these investigations are of fundamental significance in soil fertility. The recognition of these directly beneficial soil constituents is no less important than the recognition that harmful soil constituents exist. The creatinine appears to be as favorable as soil nitrates to crop production, and even to be able to replace the latter in such a manner that the amount of nitrate required is less in its presence, while plant growth is increased. The amount in soils is, moreover, comparable with the amount of nitrates as usually found in agricultural soils. Creatinine is, however, only one of a long list of nitrogenous and phosphorus carrying organic compounds of the soil, and the remarks here made will probably find application to many other of these soil constituents.

This extended study of soil organic matter or humus, about which so little definite information existed in chemical and agricultural literature, was undertaken as the result of the discovery of a harmful property in extracts from unproductive soils. This led to the discovery of harmful compounds, which fact showed the great importance of more accurate knowledge concerning that most important and yet least understood soil constituent—the organic matter or humus of soils. Starting without methods and with no definite constituent ever isolated from soil, the work has steadily progressed until to-day over 25 organic compounds have been identified and classified. The list of the compounds so far isolated varies from simple compounds, containing only carbon and hydrogen, to complex compounds, containing carbon, hydrogen, oxygen, nitrogen, and phosphorus. They are compounds which exist as such in living plants or arise from the decay or decomposition of the proteins, fats, nucleic acids, carbohydrates, and other plant and animal substances, as the result of purely chemical oxidations and reductions and through the intervention of molds, bacteria, protozoa, and other biological influences in soils. According to the factors operative in the decay of this plant and animal debris in soil, the course of change is different, resulting under one set of conditions in the formation of the abnormal and harmful constituents alluded to above and under other conditions in the formation of normal or beneficial organic constituents of soils.

It is an essential part of this survey of the organic matter in soils to learn the properties of the individual constituents and their effect on the life within the soil and on growing crops, and this phase of the subject, as well as the study of the influence of the fertilizers upon these constituents has been vigorously pushed during the past year.

The new point of view which has been brought to bear on the problems connected with the fertility of the soils has opened up avenues of profitable investigation and already forecasted results of great economic importance. These investigations have been made on soil from various parts of the United States, comprising a number of

important soil problems presented in field, farm, or region. The investigations included such prominent soil problems as those presented by the Volusia series of soils in New York and neighboring States and the peat lands on the Atlantic plains, as well as other unproductive lands in Maryland, Connecticut, Massachusetts, Pennsylvania, New Jersey, Kentucky, West Virginia, Alabama, North Carolina, and elsewhere.

Volusia soils have been studied in relation to the most responsive fertilizer combination and the effect of liming. The organic matter of these soils has received especial attention and the organic nitrogen and phosphorus forms have been determined. These have an important bearing upon the availability of these essential constituents. It has been found that the nitrogen and phosphorus are tied up in these soils in very resistant forms as constituents of a larger complex known as nucleic acid, which also contains a sugarlike principle. To effect the liberation of the nitrogen and phosphorus in available forms, this complex must be broken up into its constituent parts. This has been done in the laboratory and the nitrogen and phosphorus obtained in such forms as are utilizable by plants. The best methods of rendering the unavailable forms effective for crop growth are being studied.

The Elkton clay in Maryland has been very exhaustively studied in regard to the nature of the organic matter which differentiates this from other soil types in the same region. This especially poor soil contained very little of the weathered humus. The nature of the organic matter contained therein has been studied and was shown to contain liquid fats, fatty acids, etc.

Peat soils of the Coastal Plains were studied to determine the crops to which they are adapted and their fertilizer and lime requirements. The nature of the materials composing peat soils was determined by the methods developed in the laboratory of this bureau. An especially prominent problem in connection with peat lands is the economic utilization of the comparatively large but unavailable nitrogen supply. The organic nitrogen forms have been studied and much valuable information gained on this important agricultural problem. From these soils there have also been isolated resins, waxes, fatty substances, paraffin hydrocarbons, and other bodies in definite crystalline forms, all of which throw new light upon the processes of peat formation and its economic utilization.

Park and lawn soils from city parks and Government reservations have been studied in order to formulate the best means for their improvement, preservation, and upbuilding. Especial attention has been given in this connection to a study of the soil types best suited for building lawns and parks and the soil treatment and management requisite for a successful lawn. The association of grass and trees has been studied and particular attention given to the nature of the organic materials in such soils. Several unsuccessful lawns or parks were traced to the presence of harmful organic substances which hindered plant growth. The study of these compounds has suggested methods for their elimination and for preventing their formation.

Fertilizer requirements of soils were made on soil types from various parts of the United States. The soils studied were the Cecil

sandy loam of North Carolina, the Clyde loam and Dunkirk clay of New York, the Dutchess loam of New Jersey, the Frankstown loam of Pennsylvania, the Clarksville stony loam and Greenville loam of Alabama, the Clarksville silt loam of Kentucky, and the Dekalb silt loam of West Virginia, etc. In all these soil types the response to different fertilizers was studied and the fact determined whether the soil was in need of liming and whether it responded most to a nitrogenous, a potassic, or a phosphatic fertilizer and what was the best ratio of these constituents. In addition to the lines of work here enumerated, a number of other lines are in progress in the laboratory and in the field bearing on the influence of fertilizers on soils and other soil ameliorations.

SOIL-WATER INVESTIGATIONS, 1910-11.

Field investigations were conducted early in the year, chiefly in Kansas and Colorado, and office researches were continued during subsequent months. The field work brought out more clearly than before the natural development of the soil-forming deposits and the topographic features of the central plains region, together with the relations between the soils and the ground water. Through this region the subsoils and underlying formations are permeated by a body of moisture collected largely in the Rocky Mountains and percolating slowly (at rates determined by perviousness of the materials) eastward at depths below the surface, varying with the topographic configuration, this subterranean water generally saturating the strata and forming a sort of reservoir supplying artesian and other wells and approaching the surface to within reach of capillarity, thereby supplementing the local rainfall. Several of the formations permeated by the subterranean waters abound in soluble minerals (salt, gypsum, etc.), which are slowly dissolved and either washed out in the springs, to be carried off through surface streams, or swept seaward at depths beneath the surface. Such solvent action of subterranean waters is well known, but in the central plains region the proportion of soluble matter is so large and so related to other factors that its removal becomes a distinctive geologic agency. As the solution of rock matter proceeds the strata are weakened, and from time to time they slump beneath their own weight and that of the superposed deposits in such manner as to warp the strata, and frequently produce depressions (ranging from steep-sided pits to ill-defined basins) of the surface, when the local run-off following storms accumulates within these depressions and gradually fills them with silt eroded from the rims and neighboring uplands. So characteristic is this process, that the general surface over thousands of square miles (excepting the immediate valleys of the few rivers, like the Arkansas, fed chiefly from the mountains) is of a distinctive topographic type—coalescing basins and low divides forming an irregular surface without continuous seaward slopes. The conditions by which this topography was produced have existed for ages—indeed, throughout the greater part of the vast interval since the Cretaceous—and during these ages the progressive slumping in the deep-lying strata, with the subsequent warping of the surface and shifting of local areas of erosion and deposition, have resulted in an

immense accumulation of silts and loams forming the soils and subsoils of the region. Nowhere else in the world, so far as known, are there so extensive accumulations of subaerial deposits as in the central plains, and the accumulation is due primarily to that subterranean movement of the waters which to-day renders the silt loams more productive than they would be if watered only by the meager local rainfall.

Under the modern view of the suborganic and dynamic character of soils the chief factor of continuous activity is the circulating soil water, which maintains appropriate texture in the soil body, passes thence into the plants carrying materials for growth in solution, and finally returns through transpiration to the condition of aqueous vapor in the atmosphere. Now, the investigations have shown that in productive regions there are two sources for the soil water, i. e., (1) rainfall and (2) the store of ground water accumulated from the rainfall of previous years and nongrowing seasons. Throughout the greater part of the United States the rainfall of the growing season does not suffice to produce crops, and cropping succeeds only as the growing plants draw on the accumulated store of moisture, which is generally equivalent in quantity to the rainfall of several years; in fact, without this store farming, especially during dry seasons, would frequently fail, so that it may be viewed as the agricultural capital of the country. To this important resource the soil-water investigations have been extended during recent months, with the object of ascertaining (1) the quantity of ground water within reach of capillarity and (2) the changes in quantity attending settlement and cultivation. Generally the best indication of the ground-water level (i. e., the level at which the subsoil and underlying rocks are saturated) is afforded by wells and springs; and a census of representative wells and springs in every county in the United States was undertaken through correspondence. Some 30,000 schedules were sent out to trustworthy correspondents of the department, and most of these were filled out and returned. The data are still in process of tabulation; yet the indications are clear that throughout much of the country settled for a quarter century or more there has been a decided lowering of the ground-water level, with of course a corresponding increase in danger of crop loss through drought. Thus, in Michigan the mean water level in 794 wells lowered 2.2 feet during an average period of 18 years; in Minnesota the average lowering of water in 920 wells was 3.45 feet during 14 years; in Iowa the lowering in 1,160 wells averaged 3.6 feet in 21 years. The mean rate of lowering of the ground-water level indicated by the wells in the three States is 0.18 foot per year, or 4.5 feet during a quarter century. The facts brought out by the inquiry serve to emphasize the importance of so improving agriculture as to utilize and conserve on each farm all the water received by it during the year.

NEED OF LARGER APPROPRIATION FOR THE BUREAU OF SOILS.

It has been some six or eight years since the appropriations for the Bureau of Soils have been materially increased. During this time the work has increased in volume and importance and in recognition and appreciation by the people. The demands for the extension of the work of the bureau are large and insistent, and I feel it my duty

to call your attention to the need of larger appropriations and to the larger field of usefulness that the Bureau of Soils can fill, trusting that the present Congress may at least make a beginning in providing for a more comprehensive organization of the bureau, capable of caring for the larger activities with which it may and should be charged.

The soil is the basis for agricultural development, and a thorough knowledge of the different soil types and of their peculiar properties is the more necessary as intensive systems of agriculture are taken up. It is the foundation of both plant industry and animal husbandry, and as these two subjects develop along more highly specialized lines, the knowledge of soils and their properties becomes more and more important.

As stated elsewhere, during the 13 years that the bureau has been mapping soils there have been covered approximately 230,000 square miles in detail surveys and 226,000 square miles of reconnoissance, making in all 450,000 square miles, of which we now have definite knowledge of the distribution and properties of the soil. This work has been distributed over 450 areas, making it possible to show most of the soils of great national importance as well as many of those of local occurrence.

The demand for the rapid extension of this soil-survey work made by individuals, granges, other agricultural associations, boards of trade, and by petition from citizens of different localities makes it necessary to recommend to Congress a considerable increase in the appropriation for soil surveys. In addition to this, the time has come when the work of the bureau should be pushed further, looking to the proper application of the knowledge that has been acquired. It is important also that the work of the scientific laboratories upon the nature and properties of soils and their diseases should be expanded and that funds should be made available for the extension of this scientific knowledge and experience by its practical application in the field in the solution of soil troubles.

The following paragraphs show briefly the lines of development for which Congress should be asked to appropriate adequate funds in order that the basis already laid and the future work which is to be done shall be carried to the farmer for his use and benefit. The soil maps of themselves or the laboratory investigations when confined to scientific expression are of comparatively little use to the farmer unless the lessons conveyed by them are brought more forcibly to his attention, and no one can do this so well as those who have acquired the knowledge of the soil and its properties. It is essential, therefore, if the greatest good is to accrue from this work, that adequate appropriations be made to carry the work to its logical conclusion—to see that it is taken up by the farmer himself for the betterment of that part of his practice which is directly dependent upon the treatment and use of his soils.

DIVISION OF SOIL SURVEYS.

RECONNOISSANCE SOIL SURVEYS.

During the three years that these general surveys have been continued, at an annual expense of between \$40,000 and \$50,000, approxi-

mately 237,619 square miles have been surveyed, which, with the completion of the Nebraska area this summer, will give a continuous strip from Canada to Mexico, with the exception of a break in middle Texas. It is estimated that there remains about 260,000 square miles of the Great Plains country yet to be surveyed on a scale of 4 miles to the inch. The work so far completed embraces the western parts of North Dakota, South Dakota, Nebraska, and Kansas, the Panhandle of Texas, and a large area in south Texas. There remains to be completed the eastern parts of Montana, Wyoming, Colorado, New Mexico, and a large area in west Texas. By the end of the present field season the reconnoissance survey of the cut-over pine lands of Washington and the survey of the Appalachian Plateau portion of the State of Pennsylvania will have been completed. There has been considerable demand for this type of work for northern Minnesota and northern Wisconsin, but the funds available have not been sufficient to take up these additional areas.

DETAILED SURVEYS.

The 12 States of Alabama, Kansas, Mississippi, Missouri, New Jersey, New York, North Carolina, North Dakota, Pennsylvania, Tennessee, West Virginia, and Wisconsin are appropriating annually \$47,300 to be expended in cooperation with the Bureau of Soils for soil-survey work, to meet which the bureau is expending about \$57,000 per annum. A number of these States have signified their willingness to appropriate larger funds whenever the bureau is in position to respond and push the work more vigorously, and a number of other States have signified their intention to appropriate money to meet the bureau in cooperative soil-survey work, and I consider that it would take at least \$25,000 in addition to what is now being expended in the cooperating States to meet the increasing demands. This form of cooperation between the States and the bureau has worked very satisfactorily and has a very desirable object. Not only does it insure the work being done at about half the cost to the National Government, but it gives to the state officials an intimate knowledge of the properties of their own soils that could be obtained in no other way. It also gives to the bureau the benefit of the local knowledge of agricultural conditions and practices that add materially to the completeness and thoroughness of the work.

There are 36 States and Territories not at present in position to cooperate with the bureau through lack of funds, and in these States the bureau is expending at the present time about \$45,000 annually. To meet the demands in these noncooperating States in any sort of satisfactory way I estimate that the appropriation should be increased by at least \$75,000.

This makes a total increase of \$100,000 in the soil-survey funds, which would provide for double the number of detailed soil surveys, increasing the number of areas (counties) from 40 to 80 per annum, giving about 32 areas in cooperating States and 48 areas in noncooperating States. This would necessitate an increase in the drafting and clerical force on the statutory roll.

DETAILED SURVEYS OF EXPERIMENT STATION FARMS.

It is desirable from every point of view that detailed survey maps be made of the experiment-station farms, on a scale of approximately 1 square inch to the acre, in order that plot experiments reported from the several stations can be more accurately intercompared and that the soil type may be used as the basis for all such plot-experiment work. The attempt has been made in the past in the survey of counties in which the experiment stations are located to make these large-scale maps, and a few of them have thus been secured, but the pressure for the soil survey has been so great that it has not been possible to do this work in any systematic way, and provision should be made for it by a small specific appropriation, so that a force could be detailed to this work and it could be uniformly prosecuted to a conclusion.

DETAILED SURVEYS OF FOREST RESERVES.

Requests have been received from the Forest Service, which on account of lack of funds it has been impossible to comply with, for detailed surveys of forest reserves to aid particularly in the matter of reforestation and in the classification of forest and agricultural lands.

STATE SOIL MAPS.

The time has come in the progress of the soil survey when work in some of the States, notably Alabama, South Carolina, and North Carolina, is so far advanced that a force should be assigned to the preparation of State soil maps, including the necessary provision for field revision, the maps to be filled in and completed as the work progresses, so that when the detailed soil surveys are finished the State soil map will be ready for issue. Such a map will aid materially in the progress of the soil survey, as it will assemble on one sheet the work to date and the filling in of the future work will be greatly facilitated. It is desirable that a small fund be provided for this work.

DIVISION OF SOIL CHEMISTRY AND PHYSICS.

In the development of the work of the Bureau of Soils the time has come when a division should be organized to be known as the Division of Soil Chemistry and Physics, which should considerably extend the work that is now being done in the laboratories of the bureau. In the chemical laboratory proper there should be a small increase to provide adequately for the routine mineral and chemical analyses made necessary by the increasing demands for this work and a slight increase for the research investigations of the laboratory. An appropriation should be made to revive and extend the work of alkali investigations, which was suspended about four years ago for lack of sufficient funds. The bureau has already demonstrated the possibility of reclaiming alkali lands, but the methods necessarily differ somewhat in detail according to the properties of the different soil types, and such methods as have been most successful in washing out the alkali have at the same time left the soil, especially with certain types, in an unfavorable physical condition. In the interest of the increasing value of these lands attention should be again turned to this matter and the subject fully investigated and carried beyond the point at which it was left when the work was suspended.

One of the striking things in intensive agriculture has been the experience that lands long under irrigation change in character and become more like humid soils than soils of the arid regions. While it is reasonable to suppose that virgin soils, particularly under irrigation, should be of great and of lasting fertility, it is an actual fact that after a lapse of comparatively a few years' occupation the need of fertilizers is felt, and the largest applications of fertilizers are now being made to keep up the productivity of the irrigated soils of the dry regions of the West. An appropriation should be requested to study specifically the changes in the irrigated lands of the West in order to furnish a basis for the intelligent use of fertilizers or other efficient means of maintaining the productivity of the soils under such artificial conditions.

In the physical laboratory an increase should be made for research investigations in soil physics, with particular reference to aeration, heat, and moisture relations, subjects which have long been under investigation by the bureau and in which a great advance in knowledge is now taking place.

An appropriation should be made for soil management investigations, including particularly practical methods of controlling the physical condition of the soil through tillage. Tillage is one of the three methods for the control of soil productivity, the other two being rotation of crops and fertilization, and it is considered very important that the laboratory extend its operations to include practical methods of soil control through tillage. This it would be entirely practicable to do if funds were available.

In the fertilizer laboratory an increase is needed for the investigation of natural and artificial sources of supply of fertilizer material. During the past fiscal year an emergency appropriation of \$2,500 was available after the 4th of March, and during the present fiscal year \$10,000 was available for this work. Sufficient information has been accumulated to justify the belief that by the first of December a special report can be prepared showing that it is not unreasonable to expect that available sources of potash and of nitrate of soda can be found in this country and that our phosphate supply can be more economically used than at present.

An appropriation should be made for the purpose of investigating the method of handling and manufacturing fertilizer material and farm manures to realize the greatest possible benefit to the farmer. The fertilizer manufacturers themselves realize the importance and necessity for this work, particularly in view of the present knowledge of fertilizer use which is being developed by the Bureau of Soils. Changes take place in the manufacture and storage of fertilizers that cause inexplicable results in the crop. The idea of reversion of phosphates, the change in the composition of mixed fertilizer material on standing, the preparation and availability of waste products in the preparation of fertilizer goods all require investigations and a thorough understanding to maintain the grade of goods that will insure reasonably uniform success when applied to the soil. The importance of this work in itself, as well as the magnitude of the commercial fertilizer business and the willingness and desire of the manufacturers to understand these matters, all combine to justify the appropriation requested.

An appropriation should be made for the investigation of the relative efficiency of the different forms of fertilizer material. The question as to the relative efficiency of floats, of finely ground phosphates, of superphosphates, of the different forms of the nitrogenous minerals, of nitrogenous waste products, of which some are esteemed highly, and others, such as wool waste, are in many States prohibited by law to be used in the manufacture of fertilizers, demands that the whole subject of the relative efficiency of different forms of fertilizer material be worked out.

DIVISION OF SOIL FERTILITY.

An increase is recommended for the important research investigations that have been carried on by the bureau for some years and which are yielding such important results, particularly in the study of the chemistry of the organic matter and organic compounds present in soils.

Various organic compounds, resulting from the degradation of the remains of plants and animals, have now been isolated from soils, but the cause bringing about the formation of these compounds, whether they are derived through the agency of fungi, bacteria, protozoa, or enzymes, has not been studied for lack of sufficient funds. An appropriation is needed for soil biology in order that the agencies that act upon the organic matter and form these compounds may be studied with the object of eventually being able to control the degradation of the organic matter and to restrict it to normal lines in which it will be beneficial rather than deleterious to plants.

A small appropriation is needed for the study of the inert organic matter in soils. This material, which is of the nature of charcoal or coallike bodies, forms undoubtedly one of the end products of the degradation of the organic matter, and to study this so as to trace the line of degradation from the fresh organic matter applied to the soil or left in the soil as the result of growing crops to the final product of the hydrocarbon, requires that the work that has been done by the bureau be extended into those lines of microscopic and microchemical investigation that have to do with the coallike bodies—lines which have not previously been investigated for lack of sufficient funds.

An appropriation is requested to enable the bureau, in cooperation with the various experiment stations, to study in a scientific manner the manurial requirements of extensive soil types in order to prove conclusively whether there is any standard difference in the relation of the soil material and the manurial requirements apart from methods of control and of cropping. There is prevalent a general belief that there is a difference in the manurial requirements of different soil materials, but there is nothing so far available that will enable us to answer this question in any positive way.

About one-third of the letters received by the bureau asking advice as to the treatment and use of soils particularly demand information regarding the manurial requirements of the samples sent in by farmers. The investigations of the bureau have now reached a point where methods are available for supplying this information in a majority of cases, and it is recommended that an appro-

priation be made to enable the bureau to give advice upon this specific point.

As already stated, one of the three principal methods of soil control is crop rotation, the other two being fertilization and tillage. The principles of crop rotation and its effect upon the soil have never been worked out. It is believed that with the present advance of knowledge and the information and methods at the disposal of the bureau it is in a position to determine this principle, and an appropriation is needed for this very important and fundamental work. It is altogether probable that it will be found that the rotations adapted to one type of soil will not be necessarily most effective on other soil types. These are problems that vitally concern the farmer. Their solution may save years required to work the problem out by field methods. Not only does it require a long time to determine such matters in the field, but at the end of 15 or 25 years or more needed to get the information the soil itself may have changed materially from what it was at the beginning.

The bureau is constantly in receipt of requests for the investigation of adverse soil conditions affecting special crops, such as citrus fruits, apples, peaches, and potatoes, or of problems connected with the management of lawns and parks, clover-sick soils, and the like, which it has been impossible to investigate with the funds at our disposal. An appropriation should be made for this work in order that a special effort may be given to the solution of some of these practical problems affecting the farmer or city dweller, problems which can not be adequately handled in the course of the investigations being made in the laboratories at the present time.

DIVISION OF SOIL WATER AND EROSION.

Ever since the Bureau of Soils was established the study of soil moisture has been recognized as a difficult yet fundamentally important line of work. The part of this work dealing with the movement of moisture in the soil has been carried forward in the physical laboratory. The part involving field investigations as to the depth beneath the surface of the ground water, as to the changes in depth attending settlement and cultivation, as to the general movement of the ground waters, and as to the surface run-off of rains and the removal of the soil through erosion has been given attention for the past four years, and the results have been found to throw light on some of the most important problems of our agriculture. Two noteworthy publications on the subject have been issued within the year, and two others are well advanced in preparation. It is believed that the extension of the investigations and the utilization of the material already in the bureau are of such importance as to warrant an appropriation of \$10,000 for this work.

LINE OF WORK FOR WHICH SPECIFIC APPROPRIATIONS ARE DESIRED.

Division of Soil Surveys:

- *Reconnaissance surveys.

- *Detailed surveys of counties in cooperating States.

- *Detailed surveys of counties in noncooperating States.

- Detailed surveys of experiment station farms.

- Detailed surveys of forest reserves.

- State soil maps.

Division of Soil Chemistry and Physics:

Chemical Laboratory—

*The routine mineral and chemical analyses of soils, waters, fertilizers, and other related soil material.

*Research investigations of the mineral and chemical composition of soils as related to the management of soils and to crop adaptation and production.

Alkali investigations, including particularly methods of reclamation and amelioration of resulting adverse physical soil conditions.

Investigation of the changes which occur in the chemical and physical properties of irrigated lands.

Physical laboratory—

*Research investigations in soil physics, including particularly aeration, heat, and moisture relations.

Soil management, including particularly methods of controlling the physical condition of the soil through cultivation.

*The routine mechanical analysis of soils, fertilizers, and other related soil material.

Fertilizer laboratory—

*Investigation of natural and artificial sources of supply of fertilizer material.

Investigation of methods of handling and manufacturing fertilizer material and farm manures to realize the greatest possible benefit to farmers.

Investigation of the relative efficiency of the different forms of fertilizer material.

Division of Soil Fertility:

*Research investigations of the maintenance of soil fertility, the cause of unproductive soils, the organic origin of unproductivity and effects of green manuring, the means for improvement of unproductive soils, the effect of fertilizers on soils, and field investigation of soil-fertility problems in cooperation with experiment stations.

Soil biology—fungi, bacteria, protozoa, enzymes, and effect on production of beneficial or harmful organic compounds in soils.

Inert organic matter in soils.

Manurial requirements of extensive soil types in cooperation with experiment stations.

Manurial requirements of samples sent in by farmers.

Principles of crop rotation and effect on soils.

Adverse soil conditions affecting special crops, such as citrus fruits, apples, peaches, potatoes, lawn and park soils, clover sick soils, etc.

Division of Soil Water and Erosion.

* Entries marked with an asterisk denote lines of work at present carried on by the bureau.

REPORT OF THE ENTOMOLOGIST.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., August 7, 1911.

SIR: I submit herewith an executive report covering the work of the Bureau of Entomology for the fiscal year ending June 30, 1911, dividing it, in accordance with your instructions, under the following headings:

(1) A summary of the important work carried on during the fiscal year ending June 30, 1911.

(2) An outline of plans proposed for work during the fiscal year ending June 30, 1912, under appropriations already made for that year.

(3) Plans of work recommended for the year ending June 30, 1913.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

WORK OF THE YEAR.

The work of the year beginning July 1, 1910, and ending June 30, 1911, may be classified, as was the case last year, as follows:

- (1) Work on the gipsy moth and the brown-tail moth.
- (2) Importations of useful insects.
- (3) Exportations of useful insects.
- (4) Work on insects injurious to southern field crops.
- (5) Investigations of insects damaging forests.
- (6) Investigations of insects damaging deciduous fruit trees.
- (7) Cereal and forage plant insect investigations.
- (8) Work on insects affecting vegetable crops.
- (9) Work on insects affecting citrus fruits.
- (10) Investigations of insects in their direct relation to the health of man and domestic animals.
- (11) Work on insects injurious to stored products.
- (12) Inspection work.
- (13) Work in bee culture.
- (14) Unclassified work.

FIELD WORK AGAINST THE GIPSY MOTH AND THE BROWN-TAIL MOTH.

There has been no important change from previous years in the methods by which the field work against the gipsy moth and the brown-tail moth has been carried on. The area infested by the

gipsy moth has increased but slightly, except in Maine, where it has about doubled. Cooperative work in the several affected States has been continued as formerly. The bureau work has been confined almost exclusively to the gipsy moth. Conditions in general do not seem to be any worse than in preceding years, and in a great many instances are very much improved. From the work that has been carried on under the bureau, together with that done by the State, from the occurrence of the wilt disease, from the increasing importance of the introduced parasites, and from probably favorable weather conditions, the eastern portion of Massachusetts was in better condition than it has been for a long time. Defoliation of the street shade trees in cities and villages has been hardly noticeable, except in a few spots, and the same may be said for the roadside trees over many hundreds of miles of road. In the height of the caterpillar season occasional patches of defoliated forest could be seen, but these were by no means as large or as numerous as in previous years.

The brown-tail moth has become disseminated more widely, having extended its ravages considerably westward and slightly northward, for the reason that the brown-tail moths of both sexes are rapid fliers and general control of the spread is beyond the influence of man.

WORK IN MASSACHUSETTS.

In Massachusetts the work has been largely that of caring for the wooded roadsides along the most traveled highways. Several hundreds of miles have been kept practically clean. Nearly all of this work has been done between the northeast and northwest line from Boston. Several hundred miles of these roadsides which have been taken care of during the past two to four years have been left to the towns, in order that the work of the bureau might be extended to roadsides farther away. A large part of the work of this character in Massachusetts has now been completed. The treatment given to the roadsides has been the removal of the underbrush and the dead limbs from the larger trees, the creosoting of the egg clusters of the gipsy moth, the banding of the trees with sticky bands, and the spraying of the foliage with arsenate of lead.

A force of men has been kept scouting in towns not before known to be infested by the gipsy moth, resulting in the addition of 11 towns to the known infested area of Massachusetts. Practically all of the towns between the known infested area and the Connecticut River, and including a tier of towns west of the river, have been carefully examined, and the heretofore uninfested towns in the southeastern part of the State have been scouted. In the 11 new towns no large colonies were found.

WORK IN NEW HAMPSHIRE.

Scouting for the egg clusters of the gipsy moth was begun in New Hampshire about October 15, and approximately 100 men were continued in the work until the larvæ began to crawl. The winter was favorable for this kind of work, as there was little deep snow, except in the hilly sections west of the Merrimac Valley. In the outer towns covered in this scouting work practically every tree except in the

woodlands has been examined and all egg clusters have been creosoted. In the more seriously infested towns in the southeastern part of the State such thorough work could not be undertaken, and the creosoting was done only along the roadsides, usually to a distance of about 100 feet back from the road. Four towns in New Hampshire have been added to the infested area, there being in all 125 towns in which the gipsy moth has been found. In several of the northern towns no moths were found and it is thought that the pest has been exterminated there. This cleared area about equals the newly infested area. In several other towns there is a marked decrease in the number of egg clusters.

The New Hampshire Legislature made an appropriation during its session of 1911, but the funds do not become available until September 1, so that whatever summer work is accomplished must be done by the bureau. The trees embraced in the territory covered by two tiers of towns on the outer border of the infested area have been burlapped, and about 60 men were employed to attend the bands.

The brown-tail moth situation in New Hampshire is very serious.

WORK IN MAINE.

In Maine the bureau carried a force of men for eight or nine months scouting and creosoting egg clusters. The gipsy moth has been found in 30 additional towns, about doubling the infested area. In only two or three of these towns, however, have well-developed colonies been located. In the great majority of instances single egg clusters were found. Until the winter and spring of 1911 there were not known to be gipsy moths east of Portland, but the scouts have located them continuously for about 40 miles east of that city. The brown-tail moth has not occurred as yet north of the forty-fifth parallel of latitude in Maine.

WORK IN RHODE ISLAND.

A considerable colony was found at North Smithfield, R. I. About 500 egg clusters were creosoted and the locality was given a careful cleaning. It was afterwards gone over by the State moth force, and ought not to become serious if given careful attention by the State.

The brown-tail moth is gaining a strong foothold in the northeastern part of Rhode Island, and is causing people some trouble.

WORK IN CONNECTICUT.

The gipsy moth colony at Stonington, Conn., has not been wholly eradicated, but conditions are not more serious than a year ago. The State took care of the colony during the summer, and in the early winter one of the most experienced scouts in the bureau could find only two or three egg clusters. The gipsy moth colony at Wallingford, upon which the State began operations in December, 1909, is quite well under control. During the winter of 1909-10 several thousand egg clusters were creosoted, and last winter less than 30 were found. The bureau scouts have examined all the towns along the main route of automobile travel from New Haven to the Massachusetts line. No gipsy moths were found.

The brown-tail moth has established itself in the northeastern part of the State in several towns. A line from Providence to Springfield, Mass., would include practically the area infested.

GENERAL CONDITIONS.

The force of men on the pay roll has varied from 170 to 540. As the roadside work is carried from the cities into the farming districts we have been able to get men for the work who are more accustomed to hard outdoor labor, and the efficiency of the force is constantly increasing.

During the feeding season of the caterpillars, 10 gasoline-power spraying machines were used, and approximately 40 tons of arsenate of lead have been distributed.

The inspection of forest products shipped from the infested territory to points around its outer border has been continued, and Christmas trees and wreaths for holiday decoration have been added to the list of material which the transportation companies will not accept without inspection certificates or permits.

A most important series of experiments has been carried on with regard to the relative resistance of native trees to the attack of the gipsy moth. All publications upon the feeding habits of the gipsy moth caterpillar state that the food plants include almost our entire native flora. Although it has long been known that this insect has its favorite food plants, very few trees have been considered as immune or even resistant. It now transpires that a number of species of trees are resistant if in clean stands, or in mixed stands when all the trees are of the varieties considered resistant. An experiment, for example, has been made on a 17-acre tract of chestnut, the owners of which granted permission for the removal of all trees except those thought to be resistant. The tract was badly infested with egg clusters, which were left untreated. The trees have not been sprayed, and only a few along the roadside have been banded. The underbrush was removed, together with all the oaks and birches. There are now no trees standing on the ground except the chestnuts and a few white pines. The result was that the foliage continued practically perfect.

On another experimental tract in the town of Methuen the pines, hemlocks, and maples only were left. The egg masses were not creosoted except on a few trees. The trees on a strip 200 feet wide were banded where this lot adjoins another infested but untreated wood lot. No spraying has been done and no other attention given except to keep the few bands in a perfect condition. The foliage on this tract remained nearly perfect, whereas many of these trees would have suffered severely if the favorite food trees had been left growing, since when the foliage of the latter was consumed the others would have been attacked by the well-grown caterpillars. It seems that the trees most subject to attacks of the gipsy moth, the removal of which is advised wherever possible, are the neglected apple trees, the oaks, the birches, and the willows. The same species are favorite food trees for the caterpillars of the brown-tail moth.

The reason for the success of this new method seems to be that the young caterpillars of the gipsy moth are able to feed only upon the foliage of the favorite plants, and that when the eggs happen to have been placed upon one of the resistant species they are unable to

eat the leaves at first and spin down to the ground, where they feed upon underbrush and scrub oak until they reach a very considerable size. Having reached this size, they climb into the more resistant trees and are at that stage able to eat their leaves. As the result of this season's work it seems entirely possible to keep large bodies of woodland in perfectly good condition and well stocked with trees by the destruction of the underbrush and of the trees preferred by the caterpillars. The woodlot in Metheun, referred to above, contains an admirable stand of timber, and will probably not be harmed by the gipsy moth if some pains are taken to keep down scrub oak and other underbrush.

IMPORTATIONS OF USEFUL INSECTS.

IMPORTATIONS OF INSECT ENEMIES OF THE GIPSY MOTH AND THE BROWN-TAIL MOTH.

The work of introducing the parasites and predatory enemies of the gipsy and brown-tail moths has been continued throughout the year in cooperation with the State of Massachusetts, and during the midsummer a force of 37 men was employed to carry on the work at the laboratory and to make the necessary investigations in the field.

At the close of the fiscal year 1910 it was found that all the species of parasites which could be secured from importations of brown-tail moth hibernating nests had already been liberated and had become established to such an extent as to warrant the discontinuance of further importations of this kind. The results of later work have amply justified this course, and it has been very encouraging to find that all of the parasites which have been introduced in this way have reproduced and dispersed in a very satisfactory manner during the past season.

By means of a careful system of making field collections and checking up the spread of various imported species in the infested area in New England, it has been found possible to determine the present range of many of the introduced species. *Monodontomerus arcus*, which attacks the gipsy and brown-tail moths in the pupal stage, and which was found a year ago in nearly all of the towns between Boston and the New Hampshire line, has dispersed widely and is now to be found over practically the whole of eastern Massachusetts, in several towns near Providence, R. I., through the southern part of New Hampshire, and has extended into eastern Maine to a point nearly halfway between Portland and Bangor. *Pteromalus egregius*, a species which destroys brown-tail caterpillars in the winter webs, has been found in small numbers over a widely scattered area in Massachusetts, New Hampshire, and Maine. Two of the most promising parasites that attack brown-tail moths, namely, *Apanteles lacteicolor* and *Meteorus versicolor*, have greatly increased their range during the past year. The former has been found over approximately four times as much territory as that occupied a year ago, and while the latter has not been secured from as many additional towns, the increase is satisfactory, owing to the extreme difficulty of recovering the species in the field unless it occurs in considerable abundance.

One of the tachinid flies, *Zygobothria nidicola*, mentioned in the previous report, which destroys brown-tail caterpillars when they

are nearly full grown, has been recovered in encouraging numbers this year, and another tachinid, *Parexorista chelonie*, has also been secured in small numbers.

The increase of the various parasites that attack the brown-tail moth, therefore, has been most satisfactory. It may be necessary, however, to import still other enemies which will make more perfect the sequence of parasites necessary to bring about entire control.

Excellent results in this direction have been accomplished by the importation and colonization this year of a strong colony of *Eudoromyia magnicornis*. This insect has never been secured in sufficient numbers previously to give it a proper chance to develop, but as over 7,000 specimens have been liberated this year as a result of the importations of large brown-tail caterpillars from Russia, Spain, and Italy, it is possible to give this species an excellent opportunity to become established. It should be noted that the species above mentioned are not only spreading satisfactorily, and in some cases more than we dared hope, but that the returns from collections taken from selected portions of the infested territory indicate that most of them are increasing in the territory where they were found last year.

This has been particularly true of the tachinid fly *Comptosia concinnata*, which attacks gipsy and brown-tail caterpillars as well as many native ones. The species has become abundant enough in the central portion of the infested district so that specimens have been found by property owners without especial search and have been sent to the laboratory for identification. This species is now spread throughout the generally infested area of Massachusetts, and has been received from several towns over the New Hampshire line.

The increase and spread of the imported *Calosoma* beetle were pointed out in the last report. Returns thus far secured during the present year show a continued increase in the spread of this species, and in the badly infested section where this beetle has been found abundantly during the present season enormous inroads have been made on the gipsy moth caterpillars and pupæ, and in some cases it has been difficult to collect pupæ even in areas that were quite badly infested in the early summer, this result being due entirely to the good work done by this beetle. It is not expected that this insect will ever be able to control the situation, although it is plainly evident that it will eventually become a powerful force in helping to hold the gipsy moth in check.

One of the egg parasites of the gipsy moth, *Schedius leuana*, which is expected to become a most useful ally and which has great possibilities owing to the fact that several generations develop in a single year, has fortunately shown positive results in the field, and it is probable that the species will withstand the severe New England winters. Another egg parasite, *Anastatus bifasciatus*, is reproducing satisfactorily under natural outdoor conditions. Its spread is slow, and it does not develop in large numbers rapidly, since it has only one generation a year, but it will in time become a useful parasite.

Aside from stopping the importation of brown-tail moth nests in large numbers, there has been no effort the present year to import large quantities of parasitized caterpillars from the localities from which good colonies have already been secured. There have been,

however, large importations from Spain and from Russia. An especial effort has been made to introduce parasites not yet received in this country in sufficient numbers to establish themselves. Mr. W. F. Fiske, in charge of the laboratory, was stationed in January in southern Italy, and remained there until the close of the fiscal year, Mr. A. F. Burgess being left in charge of the laboratory. Mr. Fiske's efforts have been very successful, and he has sent over in large numbers four species parasitic upon gipsy moth caterpillars and another species which attacks gipsy moth pupæ, and these in most cases have come in excellent condition, owing to the superior manner in which they were packed and shipped. One of these species, *Apanteles solitarius*, has been liberated to the number of 23,000 adults. While it is difficult to secure evidence that this species has reproduced, owing to the fact that the cocoons are attached singly to caterpillars which are often on the leaves high in the trees, it has been possible to determine by actual rearing from material collected in the field that some of them have passed through a single generation on American soil. The parasite of the pupæ, *Chalcis flavipes*, has been liberated to the number of 10,000. This species had never before been received in sufficient numbers to make a satisfactory colonization. Another important parasite, previously received in small numbers from Russia and which was not known to occur in Italy, was found by Mr. Fiske in Sicily, and over 125,000 of its living cocoons were sent to Massachusetts in good condition.

Aside from the work of importing colonies, reproduction work, and checking up the results of the liberations that are made, it has been possible to carry on numerous minor investigations to determine the relation between the parasites imported and our native species, as well as to study the rôle which the former are likely to play in connection with various native caterpillars upon which some of them must depend to pass through a generation after the gipsy and brown-tail moths have completed their single generation. This work has necessitated the construction of new equipment and the development of more perfect rearing devices.

ATTEMPTED IMPORTATION OF THE INSECT ENEMIES OF THE WHITE FLY.

In July, 1910, an expert field agent of the bureau was sent abroad to find the original home of the white fly of the orange and to attempt to find the parasites or satisfactory predatory enemies. In November, 1910, he found the white fly at Saharampur, India, under conditions that seemed to indicate that the white fly is indigenous to that part of the country. He found that it was attacked by two species of ladybird beetles. A preliminary shipment of these beetles by mail was apparently unsuccessful. Later shipments by direct steamer from Calcutta to Boston were also unsuccessful. At Lahore, India, he found his first evidence of parasitism by internal parasites. A certain proportion of the white flies was found to contain exit holes of a true parasite. Upon the leaves sent in were found 5 specimens of a very minute parasite, which has been described as *Prospaltella lahorensis*. After visiting Java and Manila, the agent, Mr. R. S. Woglum, returned to India, and at the close of the fiscal year was engaged in an attempt to rear the parasites in sufficient numbers for introduction into the United States before the close of the summer.

IMPORTATIONS OF PARASITES OF THE ALFALFA WEEVIL.

The difficulty of fighting the recently imported alfalfa weevil in the alfalfa fields of Utah by mechanical and cultural means has started an investigation as to its parasites in its original home. Mr. Fiske, of the bureau, located at Naples, sent, in March and April, large lots of the stems of alfalfa containing eggs of an allied weevil parasitized by a minute parasite, all of which arrived in good condition in Salt Lake City, the parasites emerging in numbers, and an attempt is now being made by agents of the bureau to establish them in the Utah fields. Three other species were sent later.

IMPORTATIONS OF PARASITES OF THE IMPORTED ELM LEAF-BEETLE.

The agent at Naples succeeded in sending over in good condition eggs of the imported elm leaf-beetle, parasitized by a minute chalcid—the same species imported three years ago, which has not been rediscovered in the open in this country. He also sent over a dipterous parasite of the same insect, which also arrived in good condition. Attempts are being made to establish both of these species.

EXPORTATIONS OF USEFUL INSECTS.

An assistant in the bureau receiving a temporary appointment as entomologist to the department of agriculture of Peru, especially to study the injurious work of a scale insect on cotton, has been sent during the year a number of shipments of a minute parasite of a closely allied species from Washington. It is too early to announce results.

In the summer of 1910 Dr. L. P. de Bussy, biologist of the Tobacco Planters' Association at Deli, Sumatra, visited the United States for the purpose of investigating the damage to the tobacco crop by insects and disease and to make an effort to import into Sumatra the parasites of a destructive tobacco worm. Shipments of an egg parasite of this insect have been started by agents of the bureau in Texas and have gone to Sumatra via Amsterdam, but information as to the results of these preliminary shipments has not yet reached this country.

The brown-tail moth having entered the Province of New Brunswick, an agent of the Central Experimental Farm of the Dominion of Canada has been sent there, and to him has been shipped a colony of a dipterous parasite which has been established in Massachusetts and which occurs there in very considerable abundance.

It is considered most advisable to continue this attempt to assist foreign Governments in this way wherever possible, since by this course a most perfect understanding has been brought about among the workers in these lines in the different countries, and the United States has profited greatly by return courtesies of the same general character. The official economic entomologists of all of the Governments of the world form practically a coherent body, with almost identical interests and with every incentive for mutual assistance.

WORK ON INSECTS AFFECTING SOUTHERN FIELD CROPS.

The work on insects affecting southern field crops consisted of the investigation of eight groups of problems, as follows: (1) The cot-

ton boll weevil, (2) tobacco insects, (3) sugar-cane insects, (4) rice insects, (5) the Argentine ant, (6) the cotton red spider, (7) cactus insects, (8) ticks.

The work was conducted under the direction of Mr. W. D. Hunter, whose headquarters were at Dallas Tex., and branch stations were located at Sabinal, Tex.; Crowley, La.; New Orleans, La.; Tallulah, La.; Clarksville, Tenn.; Appomattox, Va.; and Batesburg, S. C.

THE COTTON BOLL WEEVIL.

During the year the cotton boll weevil extended its range into the State of Alabama. The season as a whole, however, was again very abnormal as regards weevil damage. On account of the peculiar conditions of the preceding summer and winter, as pointed out in the last report, a very small number of weevils issued from hibernation in the spring of 1910, and unprecedented drought from the start prevented the normal increase in the number of weevils in the field. In August so great was the effect of these checks that the weevil had done no noticeable damage to the crop in Oklahoma, and the same is true for a large area in northern and western Texas. Central Louisiana, southwestern Mississippi, and the river bottoms of the coastal region of Texas suffered more seriously than any other part of the infested region. There was a smaller increase in infested territory during the year than in any year since 1903.

The most important line of work undertaken at the Delta laboratory at Tallulah, La., was the testing of the possibility of the use of powdered arsenate of lead or other poisons in the control of the weevil. This work was suggested by the apparently favorable outcome of earlier experiments by the Louisiana Crop Pest Commission. The results of the year's experiments were largely contradictory and inconclusive. The abnormal conditions of the season and the unusually small number of weevils present were partly the cause of this. Apparently successful results were obtained in certain plats, while others on the same plantation failed to show any profit from the use of poison.

It has been found that in many quarters there are serious objections to the burning of the cotton plants in the fall. In regions where cotton has been cultivated for many years and the soil has been robbed of its humus, this objection is especially strong. The one best remedy for the weevil is the destruction of the plants in the autumn, and burning has been recommended by the bureau, but some plan less open to objection from a broad agricultural standpoint must be devised. Therefore every form or method of the burial of plants which could be practiced upon the plantation has been tried and compared against the burning of the plants at the same time. If the plants could be killed while standing in the autumn, an important advance would be gained, since it would prevent the production of the fall broods of the weevil, which are the ones which pass through the winter in the greatest numbers. An important difficulty in the method of fall destruction now practiced is that the labor available is frequently insufficient to pick the crop by the time the plants should be uprooted, whereas if a method of killing the plants while they are still standing could be devised it would be possible to continue picking the staple all through the winter. Tests have been made of various chemical means of killing the plants with this end

in view. There are many important practical obstacles to be overcome, but the work done has yielded results sufficiently definite to warrant hope of a successful outcome.

The study of the parasites of the boll weevil was continued, and experiments were made in introducing Texas parasites at two points in Louisiana, namely, Crowley and Livonia.

The study of the local modifications in the habits and life history of the weevil under the conditions of the Mississippi Delta was continued; a large number of remedies was tested, and in addition to poisons and repellents of various sorts a number of special machines was investigated. The importance of trying every remedy suggested, in order that definite advice may be given to planters, was indicated during the season by the organization of a large company in Texas for the sale of cotton seed treated by some chemical process which was claimed to have the effect of making the plants immune to weevil attack.

During the season the exact status of the boll weevil throughout the infested territory was determined. This work is necessary in order that the bureau may be ready to furnish information demanded by planters, cotton dealers, and others, and is of especial importance to States that are about to be invaded by the weevil.

The advance of the boll weevil into new regions was investigated with care. In this work the bureau cooperated with the entomologists of several States, notably Mississippi and Alabama.

TOBACCO INSECT INVESTIGATIONS.

The principal work on tobacco insects consisted of (1) investigations of means of control of the so-called hornworms and (2) the investigation of the control of the so-called tobacco wireworm (*Crambus caliginosellus*). The headquarters for the work on hornworms were at Clarksville, Tenn.; those for the wireworm investigations at Appomattox, Va.

The main work on the hornworms was the investigation of control by either chemical or cultural methods. With chemical methods many experiments were tried with arsenate of iron, arsenate of lead, Paris green, and arsenic bisulphid. The latter substance was very effective when applied at the rate of 2 pounds per acre—about as effective as Paris green. It can be applied without the use of a carrier and its bulk per pound is less than that of Paris green. The price should be very low. This substance, however, has a caustic effect upon the tobacco plant, but since the product used in the experimental work was not especially prepared for an insecticide, strong hopes are entertained that the especially washed product on hand for use during the present year may prove to be harmless to the tobacco. Some interesting points were ascertained regarding cultural methods of control of the hornworms, but the chemical means of reducing injury will best suit the needs of the planters.

The work on the tobacco wireworm has progressed in a satisfactory manner. The previous season's studies on the life history and seasonal history were verified and enlarged. Many experiments with remedies were conducted. All observations and experiments strengthened the belief that it is only by cultural means that this pest can be controlled. It feeds naturally upon certain weeds, and these weeds

are eliminated by certain rotations of crops. In this way tobacco or corn, which is also attacked by the same insect, has been freed from injury. Thus a practical system of avoiding serious damage has been perfected.

Other tobacco insects have received incidental attention.

SUGAR-CANE INSECT INVESTIGATIONS.

The work on sugar-cane insects was interrupted temporarily by the resignation of the agent in charge, who left the service August 31, 1910, but has been continued in a satisfactory manner by his successor. The investigations have dealt with the means of control of the sugar-cane borer, the sugar-cane beetle, and the mealy bug, and have also included special study of the treatment of seed cane to prevent the infestation of new localities by serious pests. All of this work has been done in cooperation with the Louisiana Sugar Experiment Station.

As the sugar-cane borer is by far the most important enemy of the crop in this country, the work was largely concentrated on this species. Extended investigation was made during the fall of 1910 of the different classes of injury which this insect inflicts upon sugar cane, and the results have been published. Observations were also made and a considerable amount of valuable information was gained regarding the hibernation and spring emergence of the cane borer, the results of thorough cleaning up of the cane fields in the fall, and other methods of control. An interesting experiment was carried on to test the effect of surrounding sugar cane with different crops. The crops being used at present are corn and cowpeas. This experiment will require two years for completion, and will include results with stubble, fall plant cane, and spring plant cane. During the year it was announced by a member of the bureau force that the larger corn stalk-borer of the Eastern States is a distinct species from the sugar-cane borer in the South. If this distinction holds good in Louisiana, it will entirely upset all recommendations regarding the planting of corn upon cane plantations. The experiments so far carried on, however, indicate that the forms in cane and corn in Louisiana are identical. An investigation of the egg parasites of the cane borer was also begun.

The sugar-cane mealy bug appears to be restricted to certain localities in Louisiana, but threatens to become generally distributed. A predatory beetle was brought from California in large numbers, which fed for two generations upon mealy bugs, apparently with great success, but later died out.

The experiments with seed cane included fumigation with hydrocyanic-acid gas, lime-sulphur dip, and whale-oil soap dip, together with other treatments. The three just mentioned gave the best preliminary results.

RICE INSECT INVESTIGATIONS.

At the beginning of the fiscal year an agent was stationed at Crowley, La., to begin studies and experiments in the control of the more important enemies of rice. The Louisiana Rice Experiment Station cooperated generously by furnishing laboratory facilities and access to a large number of experimental rice plats. The work was devoted principally to the rice weevil, which is the most important enemy of

rice in Louisiana and Texas. The primary work was to investigate the life history of this insect, concerning which very little is known. At the same time plans were made for testing remedial measures. Among the most promising of these are certain changes in manipulation of the water used for irrigation. As the insect is of an aquatic nature, it seems probable that deferred flooding of the field or the withdrawal of water for a short time during the growing season may result in considerable relief. Experiments with a number of modifications of the system of managing water were instituted at Crowley, in cooperation with the Louisiana Rice Experiment Station, and also at Stuttgart, Ark., in cooperation with the Division of Irrigation Investigations of the Office of Experiment Stations.

ARGENTINE ANT INVESTIGATIONS.

The work on the Argentine ant problem was continued. Life-history investigations were carried on, and experiments were made to discover effective means of control. Several fresh centers of infestation were discovered, so that the area affected is much larger than had been supposed. Remedial work was restricted largely to experiments in orange orchards in Louisiana. Here the ant has threatened to destroy a very profitable industry. It was found during the preceding year that large numbers of the ants could be attracted to shelter provided in boxes placed at convenient points throughout the groves. In many cases all of the ants in the field appeared to make their way into these shelters, and the experimental work in the way of destroying them in these shelters indicates that a very efficient means of control has been discovered for this insect under orchard conditions; but the method is not well adapted to city surroundings, where the ants find winter quarters under houses almost as attractive as the trap boxes. Hydrocyanic-acid gas was found not to have sufficient penetrating power to work with the traps, but bisulphid of carbon ultimately proved to be very effective and penetrated to the most remote corners of the trap boxes.

COTTON RED SPIDER INVESTIGATIONS.

Prior to 1910 some observations on the cotton red spider had been made by occasional trips of agents of the bureau to Batesburg, S. C., and other points in that State. During 1910 an agent was detailed for continuous work on this problem. He was stationed at Batesburg early in the season, and remained there until September 1. His work appears to have resulted in two important discoveries, both of which, however, are subject to verification from further studies. One of the discoveries is that the red spider does not pass the winter in the cotton fields, but spreads into the fields from a small number of wild or cultivated plants which remain green during the winter and afford it an opportunity for early breeding in the spring. The second discovery is that a modification of the well-known lime-sulphur mixture, if applied with sufficient thoroughness, will destroy the red spider in all stages.

Experiments in cultural methods of controlling this pest were conducted. Unfortunately, however, it appears doubtful at the present time whether such methods will furnish means satisfactory to the planters.

CACTUS INSECT INVESTIGATIONS.

The work in cactus insect investigations was completed during the year, and the results are about to appear in a bulletin of the bureau.

INVESTIGATIONS OF INSECTS DAMAGING FORESTS.

The work of the bureau on forest insects carried on during the year under the direct supervision of Dr. A. D. Hopkins has related especially to practical demonstrations and direct instructions and advice in the field on the results of investigations which have been carried on in past years. It is fortunate that the work has arrived at the stage where confident directions can be given so that large-scale practical demonstrations can be made with the certainty of beneficial results. The principal work has been carried on from a field station located at Columbia Falls, Mont., and at one located at Baker, Oreg. Investigations have also been carried on by experts in the District of Columbia, Virginia, Maryland, Pennsylvania, New York, Alabama, Georgia, South Carolina, North Carolina, Oregon, California, and Montana. Information has been disseminated to forest owners in nearly all of the States and Territories, and to the Federal officials of this department and the Interior Department, relating to damage to timber on National Forests, national parks, Indian reservations, and the public domains. The progress of the work generally has been very satisfactory.

The principal depredations of the year have been by the *Dendroctonus* beetles on the pines, spruce, and Douglas fir of the Northwest and Pacific Coast States and on the pine of the Southern States. As knowledge increases of the actual losses of merchantable timber caused principally by these beetles, it appears that former estimates have been conservative and that these beetles are in fact one of the principal factors in causing the enormous continued waste of the most valuable timber resources of the Rocky Mountains, the Pacific coast, and the Southern States. During the summer and fall of 1910 and the spring of 1911 there has been a very alarming outbreak of the southern pine beetle in the South Atlantic and Gulf States, and it is evident that unless concerted action is taken by the owners of pine in these States during the coming fall and winter a large percentage of the pine will be dead within the next two years.

It is significant of the practical nature of the methods of control recommended by the bureau and of the practical demonstrations that have been carried on that no complaints of depredations have come to the bureau during the year from the areas in Colorado and Montana where control work was carried on in previous years according to the instructions of the bureau. The same may be said for seasoned forest products which are damaged by the powder-post beetles; very few complaints have been made during the year by manufacturers and dealers who have heretofore suffered extensive losses from this source.

DEMONSTRATION WORK AND RESULTS.

The results of the demonstration work carried on last year in cooperation with private owners in the vicinity of Columbia Falls, Mont., in which over 10,000 trees were treated, are most gratifying,

since, instead of the former annual death of more than 10,000 trees within the area, there were this year only 2,000 requiring treatment within an area of more than 100 square miles. This is undoubtedly the direct result of the control work, which costs nothing, because the treated trees, when utilized for fuel and lumber, are worth far more than the cost of treatment.

Under an arrangement with the Interior Department by which that department allotted \$700 for insect-control work on the Glacier National Park under the immediate instructions of an expert from this bureau, 1,295 trees in the vicinity of McDonald Lake were treated during the year, and present conditions indicate that the work has been successful in arresting the spread of the damage.

Investigations by an expert in the Black Hills during the summer of 1910 show that an end has come to the extensive depredations which have been continuous during the past 10 years and which have resulted in the death of at least 60 per cent of the merchantable timber of the area. These depredations were already diminishing in 1907, so that the treatment of probably not more than 10 per cent of the merchantable sized trees infested in 1907 and 40 per cent of those infested in 1908, in connection with the natural increase of factors detrimental to the beetles, was sufficient to end the trouble.

The most extensive control work that has been attempted in this country was undertaken in northeastern Oregon in the fall of 1910 and completed on June 30, 1911. The work was done in cooperation with the Forest Service, private owners, and the General Land Office of the Department of the Interior, under an arrangement by which the Federal and private owners of the timber furnished the money necessary for carrying on the control work under the immediate supervision of experts from this bureau.

The preliminary reports indicate that 27,158 trees were treated at a cost of \$33,180 to the Forest Service, and that 6,853 trees were treated at a cost of \$2,806 to private owners; the total of 34,011 trees at a total cost of \$35,986. More than 100 men were engaged in the work during May and June. The results of this large control demonstration can not be known until the close of the fiscal year 1912, but it is believed that they will prove to be successful and that the demonstration of methods and training of men for control work will be of the very greatest value in the future.

A review of the control work carried on in the Rocky Mountain region under instructions from this bureau or according to its recommendations shows that since the forest-insect service was established in July, 1902, over 155,400 trees have been treated at an ultimate cost of \$31,211; 114,607 trees having been utilized, so as to more than cover the cost of treatment, while 44,519 trees were treated at a direct expense of \$30,925.

It is estimated that the timber saved as the direct result of control work represents a stumpage value of over \$2,000,000.

INSECT DAMAGE TO TELEPHONE AND TELEGRAPH POLES.

During the past year it has been determined through special investigations conducted by the bureau in cooperation with telephone and telegraph companies that serious and extensive damage is being done in certain localities to standing poles by wood-boring insects. The

principal injury consists in large mines in the wood near the line of contact with the ground, necessitating the frequent resetting and even replacement of the damaged poles. The character and habits of these insects have been studied during the year, and one of them has been shown to have damaged seriously from 10 to 15 per cent of the chestnut poles which have been set in the ground for from 10 to 12 years in lines in North Carolina, Virginia, West Virginia, Maryland, and the District of Columbia. The same insect has also seriously damaged a considerable proportion of the arborvitæ telephone poles in part of a line in Illinois. It has been found that by impregnating the poles with creosote, either by the open-tank process or by the cylinder-pressure process, the poles can be effectively protected. The same line of investigation has been extended from the telegraph and telephone poles to mine props and cross-ties.

INVESTIGATIONS OF INSECTS DAMAGING DECIDUOUS FRUIT TREES.

The investigations of insects damaging deciduous fruit trees have been carried on as before under the direct supervision of Mr. A. L. Quaintance. Several of last year's projects have been continued, and with the spring of 1907 certain additional investigations were entered upon.

THE PEAR THRIPS.

Further details in the life and habits of the pear thrips, a serious enemy of deciduous fruit in California, have been investigated, especial attention having been given to determining the variations in time of appearance of the adults on the trees in the spring due to climatic conditions. Weather conditions obtaining during the spring of 1911 considerably modified the behavior of the insects, and they emerged from the ground over a considerably longer period than usual and were much less abundant at a given time than during former years. For this reason spraying operations against the adults were not as effectual as heretofore, and spraying against the larvæ, later appearing, was of correspondingly greater importance.

The spraying experiments under way in orchards during 1910 were quite successful, as shown by the condition of crops on sprayed and unsprayed plats at picking time of the fruit in the fall. Thus, in the case of prunes in the Santa Clara Valley, the yield from a sprayed block was 367.93 boxes per acre, with a value of \$320.82, as compared with a yield of 7 boxes per acre on the unsprayed block, with a value of \$6.65. On a block of trees thoroughly plowed and cross-plowed in the fall for the destruction of pupæ in the ground the yield was 85.65 boxes per acre, with a value of \$74.85.

In another orchard the yield from 300 trees, which had been thoroughly plowed the fall previously and given three spray applications in the spring, was 136.08 boxes per acre, with a value of \$190.08, while on an adjacent block of 98 trees, which received thorough cultivation in the fall, but no spray applications in the spring, the yield per acre was 26.46 boxes per acre, with a value of \$34.02. From the check block, which received no cultivation or spraying, the yield was but 2 boxes of fruit per acre, with a value of \$2.59.

In addition to the benefits in increasing the yield by plowing and spraying operations, in the case of prunes the treatment greatly increases the value of the crop by preventing scabiness of fruit, which greatly reduces its market value.

The operations in Contra Costa County were likewise notably successful. Thus, in the case of Bartlett pears, 550 trees which received two spray applications against the adults and a portion of the trees receiving a third application against the larvæ, all trees without exception came into full bloom, while the untreated adjacent trees showed only a few scattered blossoms, and these were badly injured. The yield of No. 1 fruit from the 550 sprayed trees was 1,700 boxes and of No. 2 fruit 150 boxes, with a total value for the entire crop of \$1,435, or about \$2.60 per tree. The unsprayed trees gave a yield of less than one-fourth box per tree, the fruit being much scarred, misshapen, and unmerchantable, and worth not over 12½ cents per tree, thus showing a net benefit from spraying of \$2.125 per tree, or approximately \$225 per acre.

Spraying cherries in Sacramento County also gave satisfactory results. Thus, the net value of fruit per tree in the sprayed blocks was \$8.99, as compared with the valuation of fruit from unsprayed trees of \$0.789 per tree. Deducting the cost of spraying, there is shown a net gain per tree of \$7.49 for spraying, or approximately \$889.80 per acre.

Results of experiments and life-history studies of the thrips were published in Circular 131 of the Bureau of Entomology, issued in January, 1911, which was widely distributed to fruit growers in the infested territory. This publication resulted in a notably increased interest on the part of orchardists in the warfare against this pest. A large number of fruit growers in the Santa Clara Valley and elsewhere provided themselves with power and other spraying apparatus, and a large amount of spraying was accomplished.

In the bureau's field work in the spring of 1911 several orchards were selected for settling additional points which had come up and particularly for carrying out large-scale demonstration spraying.

Agents of the bureau have endeavored to keep in close touch with orchardists, giving them instructions in the preparation and use of sprays, and it is believed that the growers for the most part are now fairly familiar with the rather exacting conditions for successful thrips spraying.

The territory infested by the pear thrips from all available information has apparently not materially increased during the past year. Increased injuries, however, in the Courtland district have been the subject of considerable complaint by growers there located, and it is planned to locate a man in that district during the spraying period another spring.

THE CODLING MOTH.

Work on the codling moth, an important apple pest, has been continued largely along the lines followed during previous years. The detailed life-history studies of the insect, in progress in different fruit regions, are being satisfactorily accomplished, and it will be possible, it is thought, to conclude these observations in the Michigan fruit belt at the close of the present growing season. The studies in Santa Clara Valley, Cal., are also nearing completion. The life-

history investigations alluded to in my last report as in progress in northwestern Pennsylvania have been completed and the results reported upon in Bulletin 80, Part VI. Additional studies of this character will be undertaken another season, if practicable, in the Southwest, perhaps in Arizona or New Mexico, and in the Southeast, possibly in northern Georgia. It is also hoped to make arrangements for similar work in some of the important fruit districts in the arid valleys of the West, where conditions are such that the pest is especially troublesome.

The experiments in progress during 1910 to test the relative merits of the one-spray versus the usual schedule of applications in the control of the codling moth did not, on account of the comparatively little injury in the orchards treated, furnish marked results, so that this work was continued, beginning with the spring of 1911. The experiments are in progress in Kansas, Delaware, West Virginia, and Michigan, and it is hoped that the results of this season's work will permit of final conclusions on the subject.

In conjunction with the one-spray work, demonstrations in spraying are in progress in the localities mentioned, designed especially for the benefit of orchardists. Careful records are being kept of the costs and benefits of the work, so that results may be stated in terms of dollars and cents. The field work also includes the use of several different arsenicals that further information may be obtained regarding their comparative value.

The growing importance of the apple-growing industry throughout the Appalachian Mountain region, especially in the Virginias, North Carolina, and Maryland, has rendered desirable more accurate information relative to the variations in the life and habits of the codling moth due to location, especially as bearing on the times when spraying applications should be made to secure the maximum benefit. A thoroughgoing study of the insect throughout this region was therefore undertaken, beginning with the spring of 1911, and the work assigned to two men, with headquarters in West Virginia. Careful records are being obtained in orchards in both valley and mountain regions, and in the latter case from some localities representing considerable altitudes.

The life-history studies of the codling moth in the Ignacio Valley in California, and the spraying experiments in progress on pears, mentioned in the last report, were completed, and the work reported upon in Bulletin 97, Part II. The results obtained show that it is entirely practicable largely to prevent loss of pears from this insect by timely spraying, and recommendations of the bureau have already been largely adopted by pear growers.

THE PLUM CURCULIO.

The spraying demonstration and experimental work for the plum curculio in the South in progress during 1910, in cooperation with the Bureau of Plant Industry, was successfully completed and the results given in Farmers' Bulletin 440, issued in March, 1911. The results obtained were quite as favorable as those secured during the previous year, and show conclusively the entire practicability of controlling the plum curculio and certain important peach diseases by the use of a combined spray of arsenate of lead and self-boiled

lime-sulphur wash. As a result of the department's work on peach spraying for these troubles, the practice is now followed by a very large number of peach growers. A total of probably 4,500,000 to 5,000,000 trees was sprayed with this mixture during 1910.

Beginning with the spring of 1911 the demonstration work was continued, but located in certain Middle Atlantic and Northern States, as representing distinctly different climatic conditions. Work is in progress in Delaware, West Virginia, and Michigan; and, in addition to work on the peach, plums and cherries are also being treated. In connection with the one-spray and demonstration spraying of the apple against the codling moth, results are also being obtained as to the effect of these treatments on the plum curculio.

A thoroughgoing life-history investigation of the curculio was begun in 1905 in conjunction with other work at several of the bureau's field laboratories and in the insectary in Washington. A large amount of information has now been accumulated on the growth and development of the insect in widely separated localities, as in western New York, in Michigan, in the environs of Washington, D. C., in Georgia, and in Arkansas. These studies sufficiently cover its range of distribution and indicate important variations in its habits and behavior. A full report embodying the results of these investigations has been prepared and submitted for publication.

MISCELLANEOUS APPLE INSECT INVESTIGATIONS.

For some time it has been desired to begin a study of certain important apple pests which, though of less economic importance than the codling moth and San José scale, are nevertheless very troublesome, and each year cost apple growers a large amount in loss of trees, labor, etc.

APPLE-TREE BORERS.—Principally two species of coleopterous borers infest the apple. An investigation of the life and habits of these insects was begun in the spring of 1911, and attention will be given to determining, if possible, economic methods for the protection of trees from their ravages.

WOOLLY APPLE APHIS.—An investigation of this serious pest has also been started and will include an inquiry into its life and habits and the use of remedies for preventing or lessening injuries in orchards and nurseries.

THE FRUIT-TREE LEAF-ROLLER.—Much complaint of ravages by this insect (*Archips argyrospila*) is received every year from the Southwest, notably New Mexico and central Kansas. In connection with other work in the Southwest, a life-history study of this leaf-roller is in progress, and experimental work for its control is being carried out in New Mexico.

MISCELLANEOUS GRAPE INSECTS.

Several important insect enemies of the grape were given attention during the season of 1910, the work being located at North East, Pa. These were the rose-chaffer, the grape leafhopper, and the grape berry moth.

The rose-chaffer has continued quite troublesome in vineyards, especially in regions where sandy soils predominate. Investigations of this insect are being continued the present season, and further data

will be obtained on its life history. Especial attention, however, is being given to determining remedies for its control in vineyards, and to protect other crops that are subject to attack. The results of last season's work were very encouraging, and the demand for information on the subject by vineyardists rendered it desirable to furnish a preliminary report, which was issued as Bulletin 97, Part III.

The grape leafhopper, always present in vineyards, periodically becomes abnormally abundant and destructive. This insect is now much in evidence in vineyards in western New York and the Erie Valley, and its injuries have been so severe as to require attention. The work carried out during 1910 indicated that much benefit would result by the timely use of strong nicotine sprays, and further experiments are in progress with this and other washes during the season of 1911. A preliminary report embodying the results of 1910 has been published as Bulletin 97, Part I.

The grape berry moth, alluded to in former reports, is of irregular occurrence in vineyards, though often very destructive. It has thus been difficult to obtain suitably infested vineyards for proper experimentation, though much information has been obtained on the life history of the pest. In order to obtain final data on the use of certain sprays against this insect a badly infested vineyard in the neighborhood of Sandusky, Ohio, is being used the present season for experimental work. In addition to the use of arsenicals, test is being made of the possible value of nicotine sprays, which have recently come into much use against nearly related insects in France.

GRAPE PHYLLOXERA INVESTIGATIONS.

A detailed life-history investigation of the grape phylloxera, a serious grape pest, was begun in the spring of 1911, with headquarters at Walnut Creek, Cal. The study will include its complete life cycle and methods and rate of reproduction, and especial attention will be given to its means of dispersal under California conditions. Information is also being collected on the history, present distribution, destructiveness, and spread of the insect in that State. In cooperation with the Bureau of Plant Industry, experiments are in progress to determine the degree of resistance to the insect of roots of different varieties of grapes. The plants are given colonies of the insect by grafting into the roots pieces of infested roots, and the degree of resistance will be learned by noting the behavior and multiplication of the insects themselves, in addition to the condition of the vines, with which phase of the subject the Bureau of Plant Industry is concerned.

PARASITIC AND PREDACEOUS INSECTS.

As indicated in the report for 1910, it was planned to establish a laboratory for the detailed study and rearing of parasitic and predatory insect enemies of various deciduous-fruit insects. This laboratory has been established and work has been begun. Especial attention is being given to the study of the life histories of certain hymenopterous parasites of the codling moth and plum curculio and also to the study of life histories of certain coccinellid beetles predatory on plant-lice and scale insects. It is hoped that these studies

will result in information which will permit of the propagation in numbers of these beneficial forms and which will also contribute to their more ready establishment in orchards.

INSECTICIDE INVESTIGATIONS.

Laboratory and field experiments have been continued with various insecticides, especially lime and sulphur preparations, several arsenicals and other toxic substances as possible substitutes for these, nicotine sprays, distillate emulsions, etc.

It has appeared that recommendations as to the amount in proportion to water of a given arsenical, as arsenate of lead, which should be used in sprays in the control of certain important pests, are more or less arbitrary and not based on sufficient experimental work. On account of the present large annual use of arsenical sprays, it is very important to know the minimum amount of arsenic required to control a given insect satisfactorily, thus avoiding the waste resulting from the use of an unnecessarily large amount. Some experiments have therefore been undertaken to determine as exactly as possible the quantity of arsenate of lead which should be employed satisfactorily to control the codling moth and plum curculio on apples and peaches. The experiments cover the use of arsenate of lead at strengths ranging from one-half pound to 5 or 6 pounds per 50 gallons of water.

CEREAL AND FORAGE PLANT INSECT INVESTIGATIONS.

The cereal and forage plant insect investigations, carried on under the immediate direction of Mr. F. M. Webster, have shown good results and have opened up several new problems of importance.

WORK ON THE SO-CALLED GREEN BUG.

A threatened outbreak of the so-called green bug demanded attention from a number of members of the force. The manuscript for a bulletin on this pest has been completed and now awaits publication. In future it will be necessary to keep the whole southwestern country under continued surveillance in the fall in order to be able to warn farmers of impending danger from this pest.

WORK ON THE JOINTWORM.

Work on the jointworm has been continued. The damage caused by the insect was less in Ohio and Indiana than during the two previous years, probably due to the attacks upon it of the predaceous mite *Pediculoides ventricosus*. As indicating the excessive abundance of this mite in some parts of the country, Dr. Jay F. Schamberg, a leading dermatologist of Philadelphia, Pa., reported that—

In August, 1910, the National Guard of Pennsylvania was encamped at Gettysburg in a wheat field opposite the battle field of Gettysburg. The Third Regiment of Pennsylvania used straw in the soldiers' sleeping bags. About 300 men were attacked with grain itch. This information was received from Dr. Luburg, of Philadelphia, assistant surgeon of the regiment. The First Regiment, which was encamped close by, had straw supplied to it, but Dr. Turnbull, the surgeon, would not permit it to be used. Some few cases of grain itch developed among the men of this regiment. The straw was reported as received from a source in Gettysburg.

HESSIAN FLY INVESTIGATIONS.

Most of the investigation of the Hessian fly has been carried out in western Washington and Oregon, and comprises not only studies of parasites but efforts to spread the *Polygnotus* that has been so successfully introduced from Kansas. Besides this, considerable attention has been given to the effect of humidity on the hatching of the eggs of the fly, for the purpose of finding out whether wheat grown in arid regions by dry-land farming may not be safe from Hessian fly attack, because of the impossibility of the fly existing there.

In the East considerable damage has been done in some localities and an effort has been made to collect data relative to the time when seriously ravaged fields were sown. In all cases the sowings were found to have been made earlier than the experimental sowings carried on during past years by the bureau, indicated as safe.

THE NEW MEXICO RANGE CATERPILLAR.

Dry weather during the period of egg hatching last summer appeared to destroy the vitality of many eggs of the New Mexico range caterpillar. Beyond a surveillance of the country to determine the spread of the pest, little progress has been made in the work on this species.

THE ALFALFA WEEVIL

The situation regarding the alfalfa weevil is continually becoming more serious and alarming. The last Congress made immediately available \$10,000 for this investigation. With this fund work was begun April 1, 1911.

During the first half of the fiscal year an expert of the bureau, working in cooperation with the Utah Agricultural Experiment Station, traced the spread of the insect from Salt Lake southward to Springville and north to near Ogden, west to beyond Tooele, and east to near the borders of Wyoming and Colorado. Judging from what has been observed between Salt Lake City and Ogden and between Ogden and Brigham, the uniform normal spread of the pest is about 30 miles each year, though circumstances may greatly change this. During the last half of the fiscal year, with the aid of the new appropriation, a great number of experiments was carried out with mechanical contrivances for destroying the pest in infested alfalfa fields and thereby protecting the second and third crops. As elsewhere stated, through the aid of an agent in Italy four and probably five species of parasites have been transported from Italy to Utah and colonized in the fields. The results of this work can only be learned next spring, when the parasites should appear in the fields. Thus the work has divided itself into three sections—marking the spread of the pest, devising mechanical contrivances for its control in the field, and the introduction of parasites.

WHITE GRUB INVESTIGATIONS.

Investigations of the several species of *Lachnosterna* in different parts of the country were taken up, and considerable work has been done in New York, Pennsylvania, and Indiana. The present inten-

tion is to carry out a thorough and systematic investigation, over the entire area of distribution, of the economic relations of these insects to the production of grains and forage crops. This involves the greater portion of the time of several assistants.

WIREWORM INVESTIGATIONS.

An investigation of wireworms, which are very destructive insects, was begun two years ago in eastern Washington, and also to a limited extent in the Eastern States. Investigations of the species attacking wheat and corn in the extreme Northwest will probably be finished the present year and facts be in shape for publication. The beginnings that have been made in the investigation of these insects throughout the East and Middle West are being continued and extended.

CLOVER AND ALFALFA SEED CHALCIS.

So destructive has the clover and alfalfa seed chalcis become to alfalfa seed, especially in the Western States, that its destruction has become a serious obstacle to the production of alfalfa seed. A thorough investigation of the species has been taken up and considerable progress made in Arizona, Kansas, and Utah. It is also being investigated as a clover-seed insect throughout the East and Middle West.

THE CORN LEAF-APHIS.

The corn leaf-aphis (*Aphis maidis*) has received considerable attention in the North, not on account of its destructive habits—for it is a comparatively harmless insect there—but because of its supposed relation to the corn root-aphis. In the South, however, it is injurious to the barley crop, and the damage is very serious along the Mexican border from the Gulf to the Pacific and extending northward for a considerable distance. An effort is being put forth by the farmer to find some kind of grain that can be grown in that part of the country. So far it would seem that but for the attacks of this insect barley might be grown profitably and thereby solve this problem. In order to aid in the efforts of farmers over the area indicated, extended investigations of the species have been undertaken along the southern border of the country.

COWPEA AND SOY BEAN INSECTS.

The investigations of the cowpea curculio have been concluded and the results published in Bulletin 85, Part VIII, of this bureau. The area over which cowpeas and soy beans are at present being grown has become very extensive and is constantly increasing. An investigation of the insect enemies of these two forage crops has been undertaken by two assistants of the bureau and a portion of their investigations will probably be ready for publication during the coming fiscal year.

OTHER INVESTIGATIONS.

The investigation of the alfalfa butterfly in southern California has been carried to a point where practical information has been

secured, and as this seemed to be of considerable importance to the farmers, this information has been published in the form of a circular, while the investigations are being continued.

The investigation of the new gallfly attacking seed pods of alfalfa in Arizona and New Mexico is also being continued, as well as investigations of the southern corn leaf weevil.

The investigation of the relation of leafhoppers to the cultivation of grains and grasses has been included in a manuscript now ready for publication.

A number of destructive insects not heretofore known to the farmers of the United States has been found about Brownsville, Tex., and their habits are being investigated with a view of finding out to what extent they may become injurious in the South.

A new rootworm has proved destructive to corn, sorghum, and millet. It is being investigated in both Texas and Arizona.

Two species of thrips not only injure the foliage of alfalfa in the Western States, but there is good evidence that they are involved in the blighting of the blossom. These two species are being investigated in southern California and Arizona, the accumulated data being nearly ready for publication in the case of one species. A third species is being investigated in Oregon and Washington.

A species of *Eleodes* has been destructively abundant in Washington, the larvæ working a great deal of injury in wheat fields. This problem is likely to be completed during the present calendar year.

The investigations of the maize billbug have been completed and the results published in Bulletin 95, Part II. A similar investigation of an allied species, *Sphenophorus callosus*, is under way and definite results will be published, together with practical measures for methods of preventing a repetition of the serious damages to corn that have occurred in the past.

Next to wireworms and white grubs, the most destructive insects in cornfields, particularly where corn follows grass crops, are the corn webworms, and investigations of these insects have been taken up in Ohio, New York, Pennsylvania, Delaware, and North Carolina. Probably a number of years will be required for the completion of these investigations.

Investigations of cutworms and experiments for their control in cornfields have also been undertaken in several States.

WORK ON INSECTS AFFECTING VEGETABLE CROPS.

The work on insects affecting vegetable crops, carried on as heretofore under the direction of Dr. F. H. Chittenden, has during the year comprised investigations at several field stations in different parts of the country, where habits and life histories of truck-crop insects have been studied and where experiments have been made with different remedies with very considerable success. New insecticidal compounds have been tested and satisfactory field demonstrations have been made against some of the most important truck-crop pests.

INVESTIGATIONS IN TIDEWATER VIRGINIA.

The work in tidewater Virginia, mentioned in the last report, was continued through the year. Several species of plant-lice were experimented with, especially the cabbage aphid, the pea aphid, and the spinach aphid, and it was found after experimentation with various substances that nicotine sulphate, 1 part to 900 of water, with the addition of a little whale-oil soap, brought about the most effective results. Whale-oil soap at the rate of 5 pounds to 50 gallons of water gave practically the same results, but was injurious to the plants.

In the course of experiments to stop the injury of grasshoppers to kale, it was found that an application of whale-oil soap, 4 pounds to 50 gallons of water, completely checked the invasion of this pest, making the plants so distasteful that the grasshoppers soon left the field.

An interesting experiment was made with the use of a plumber's gasoline torch against the harlequin cabbage bug, and it was found that upon horse-radish 95 per cent could be destroyed by the torch without injury to the plants.

A lengthy series of experiments was made against the Colorado potato beetle with arsenite of zinc and lead chromate in comparison with better-known poisons. The lead chromate had little effect, whereas the arsenite of zinc at the rate of $1\frac{1}{2}$ pounds to 50 gallons of water was fairly effective.

An interesting series of experiments against earthworms on lawns was carried on, and the best results seemed to follow the use of kerosene emulsion, together with a proprietary compound composed of a mixture of 24 per cent soda soap and 20.50 per cent of fatty matter, combined with some less active ingredient.

INVESTIGATIONS IN SOUTHERN TEXAS.

In Texas much work was done on the onion thrips, an insect which damaged 25 per cent of the onion crop of Texas during the season 1910-11. When spraying was begun sufficiently early—that is to say, before the plants had begun to curl and before the ends of the leaves had begun to die—good results were gained. The insecticides which have given the most favorable results are nicotine solutions combined with whale-oil soap, strong turpentine soap, lye-sulphur, and the lime-sulphur solutions. Kerosene emulsion was used to some extent, but, owing to the hardness of the water in southern Texas, it was very difficult to secure an emulsion that would remain stable long enough to be applied. More work must be done in order to devise some method of spraying that will lessen the number of applications and to perfect a machine which will cover more than one row at a time without injuring the onions.

The seed-corn maggot caused damage to onions and other truck, especially beans, in the lower Rio Grande Valley, and the injury was greatest where cottonseed meal or other decaying organic matter was used as a fertilizer. The damage was almost entirely to the first planting, and where this approximated 50 per cent the entire crop was plowed up and destroyed by fire. The soil was cultivated in some form daily for about a week, and then a second planting was made of the field. This second planting did not suffer.

A number of other insects was studied, especially the cabbage aphid, the cucumber beetle, the garden webworm, and the sugar-beet webworm, and all were controlled by appropriate sprays.

The blister beetles did considerable damage to eggplant, beets, and potatoes. One application of arsenate of lead, 3 pounds to 50 gallons of water, checked their ravages. In five days after spraying not a living beetle was to be found in the field.

INVESTIGATIONS IN CALIFORNIA.

The principal work in California was conducted on the beet root aphid, the bean thrips, the celery leaf-tyer, and the strawberry white fly. The full life history of the beet root-aphid was worked out.

The bean thrips was the subject of an especial investigation. Its life history and different food plants were studied, and it was found that it is subject in one locality to attack by a very minute parasite. This is the first record of a hymenopterous parasite attacking any species of thrips, and it may be that the discovery will be one of importance if the parasite can be reared in numbers and induced to attack other species of thrips, as the pear thrips or the orange thrips.

The strawberry white fly was discovered late in September, causing extensive damage to strawberries in the San Gabriel Valley. This is the first record of this insect in California, and it has evidently been introduced into the State on nursery stock; in fact, in a shipment of four crates by express from Tennessee that was examined, the plants were found to be infested with the larvæ and pupæ of this insect. Since that time it has been found over almost the entire State. It seems to breed continuously throughout the season in California, and for this reason it is likely to become a more serious pest in California than in the East. Experiments showed that where plants are fumigated with hydrocyanic-acid gas before they are set out they can be freed from the pest.

The most serious attacks upon the sugar beet in southern California were by cutworms. In this part of the State alone over 1,000 acres had to be replanted. It was shown that where the first planting had been destroyed the second planting could be protected by the use of dry poisoned bait at a cost of from 40 to 50 cents per acre. If the attack is noticed in time the beets can be protected from injury by cutworms by the use of some bait at a cost of not over \$1.50 per acre, while to replant represents an outlay of fully \$5 to the acre. Farther north another agent with headquarters at Sacramento began work in January, 1911, but his work so far has been only preliminary.

INVESTIGATIONS AT ROCKY FORD, COLO.

Beginning with March, 1911, an agent was placed again at Rocky Ford, Colo., and began work upon the beet webworm, the beet army worm, the so-called alkali bug, and the onion thrips. The extensive damage to sugar beets, cantaloupes, beans, and other crops during 1910 by grasshoppers also led to work upon these insects. Studies have been begun upon the flea-beetles damaging sugar beets and upon the sugar-beet leafhoppers.

WORK IN INDIANA.

Although the onion thrips has been the subject of investigation for the past four years in Florida, Colorado, California, and especially in southern Texas, an outbreak of this insect in the vicinity of Knox, Ind., covered an entirely new region where conditions are quite different. Damage from the thrips in that region during 1910 was estimated at \$54,000 and undoubtedly will prove much greater in 1911, as the acreage devoted to this crop has been doubled. Here the mistake has been that the growers do not begin work upon the thrips in time. Experiments are now going on and new adjustments are being made on sprayers which will undoubtedly give excellent results.

Cutworms damaged onions in this region during May and early June, and about 400 acres were treated with the usual bran-mash remedy with excellent results.

OTHER WORK.

Investigation of insects injurious to late cauliflower and related crops on Long Island has been begun.

Work upon asparagus insects has been taken up in Maryland, and the egg parasite of the asparagus beetle has been imported from Massachusetts.

Although the sprays tested have been found to be effective against plant-lice on the various truck crops in tidewater Virginia, it has been deemed worth while to import ladybird beetles in the effort to hold the plant-lice distinctly in check. The spotted ladybird has been introduced from New Jersey and liberated at Warrenton, Va., with promising results. In cooperation with the California State Horticultural Commission 60,000 beetles were sent from California for liberation near Norfolk. The species was the so-called convergent ladybird. The main object of this last introduction was to endeavor to keep the spinach aphid under control in this way, since the growth of the spinach plant is such that it is very difficult to reach the plant-lice with a spray.

Work on hop insects has been taken up in California, and the hop flea-beetle, the red spider of the hop, and the hop aphid have been studied. Excellent reports of progress in the control of these insects have been made.

WORK ON INSECTS AFFECTING CITRUS FRUITS.

The work on insects affecting citrus and other subtropical fruits is carried on under the direct supervision of the assistant entomologist, Mr. C. L. Marlatt. The principal subjects under investigation have been the white fly in Florida and the orange thrips in California, together with certain minor or newly introduced insect pests, chiefly in Florida. The hydrocyanic-acid gas fumigation investigation was completed July, 1910, and was discontinued during the last fiscal year.

WORK ON THE WHITE FLY IN FLORIDA.

It was indicated in the report of last year that the main features of the Florida white-fly investigation were approaching completion. The life-history studies, fumigation experiments, and control by

fungous disease have been carried out probably in sufficient fullness and detail, and the final reports covering these subjects are now in press or practically ready for publication. Aside from the completion and reporting on these subjects, the chief work of the year has been experimental testing and demonstration of the value of different spray applications. The conditions of Florida citrus culture are such that very often gas treatment is too expensive, especially with an insect such as the white fly, where reinfestation from neighboring neglected groves is very easy. Hence the necessity of determining the most practicable and effective spray applications, which are much cheaper, for a single treatment at least, than hydrocyanic-acid gas fumigation. The principal insecticide washes experimented with include (1) a considerable series of oil-soap emulsions made with different brands of oil; (2) several of the commercial miscible oils which are very similar in composition to the oil-soap emulsions; and (3) sulphur washes. A good many other recommended mixtures have also been tested, and the Florida grower has been protected in this way from the purchase of worthless insecticides. It was hoped that the insecticide work would be completed this season, but it has not been possible to bring it to a conclusion, and another season's work will be required to finish the needed experimental tests. This work has been conducted, in all cases where the mixture warranted it, on a considerable scale, often over entire orchards, to give the tests the greatest practical value. It seems pretty well demonstrated that spraying will, under Florida conditions, be more generally adopted in the future than control by fumigation.

In a previous paragraph in this report, under the heading "Importations of useful insects," an account has been given of the sending of an expert assistant in search of the original home and the natural enemies of the white fly. This forms an integral and important portion of the white-fly work.

THE ORANGE THIRPS.

The investigation of the orange thrips is still under way at Lindsay, Cal., and has been extended to southern California, particularly in the Riverside district, where the same or an allied thrips is causing considerable damage. Control by cultivation and fumigation proved unsatisfactory. The spray which has given the best results is a lime-sulphur solution with a tobacco extract added. Three applications—two in the spring and one in the fall—have resulted in saving from 20 to 60 per cent of the fruit. The work of the past fiscal year has been a continuation of spraying tests modified from the results obtained the previous year in connection with demonstration orchard sprayings. More than 20 different spray tests are being carried out, including, in addition to the sulphur washes, various soapy, oily, and tobacco washes, a plat of 50 trees being used in each test, with suitable check trees left unsprayed. The season has not been altogether favorable for these experimental tests in that the thrips itself has been less abundant, owing to climatic variation, than in previous years, but it is expected that the work of the fiscal year 1912 will fairly well demonstrate the best means of control by spraying. An investigation has been made of the situation at Riverside, and some preliminary spraying experiments are under way.

MISCELLANEOUS SUBTROPICAL INSECTS.

As opportunity has offered, some investigation has been made and a careful watch has been kept of insect pests, particularly newly imported ones, affecting other subtropical fruits. This relates particularly to *Pulvinaria psidii*, probably the worst pest in southeastern Asia of citrus and other subtropical fruits. This insect has in recent years been introduced on nursery stock into Florida, and seems to have been widely distributed by one of the leading nursery firms of that State. It is now exhibiting its possibilities for damage, particularly on fig, at West Palm Beach, Miami, and other points in Florida. The *Aleyrodes howardi*, a not very close relative of the white fly, has become established on the east coast of Florida, having evidently been brought over on stock from Cuba, where it seems to be native. An oriental scale pest, *Conchaspis angræci*, has become established on figs at Miami and probably elsewhere in Florida. The mango weevil, *Cryptorhynchus mangiferae*, has come in very commonly in mango seeds imported for planting during the last year. A warning circular on this insect has been issued by this bureau. Two important mango scales which have been brought in on recent shipments of mango trees to this country are still in existence in Florida. These mango pests, and especially the weevil if it becomes established, will seriously affect the future of the mango industry of Florida.

INVESTIGATIONS OF INSECTS IN THEIR DIRECT RELATION TO THE HEALTH OF MAN AND DOMESTIC ANIMALS.

THE HOUSE FLY AND THE MALARIAL MOSQUITO.

The work upon the house fly has been continued and new facts have been ascertained which have a practical bearing upon the general crusade now being carried on in this country against this disease-bearing species. A new Farmers' Bulletin upon the subject has been published and is being widely distributed, and many communities in various parts of the country are making an organized effort to limit the numbers of the pest.

The spread of the boll weevil into the Delta region of Mississippi has complicated the labor problem in that part of the country, since the negro population is moving away into regions not yet reached by the weevil. The substitution of white labor for this vanishing negro labor meets with the strong obstacle that although very rich that portion of the country is highly malarious. A Farmers' Bulletin entitled "Some Facts about Malaria" has, therefore, been published during the year, and in it the full story of the relations between the *Anopheles* mosquitoes and malaria is told. A companion Farmers' Bulletin giving remedies to be used against mosquitoes was issued at the same time.

WORK ON TICKS.

Under Messrs. Hunter and Bishopp, of the bureau, work on the tick which has been proved to be the transmitter of the disease of man known as the Rocky Mountain spotted fever was given especial attention. The distribution of the species was studied throughout a portion of the year 1910 and it was found to occur in more than 180

formerly unsuspected localities. The area in which the disease carrier occurs was accurately mapped, as indicating the possible distribution of the disease. The investigation of this dangerous tick in the Bitter Root Valley, where a very virulent strain of the disease occurs, was continued along the lines mentioned in the last report. Cooperation with the Montana Experiment Station and the Bureau of Biological Survey was continued. Early in this investigation two discoveries of great importance were made. One was that the tick is remarkable in its ability to exist for a long period without feeding. The adult tick was found to be able to exist for nearly two years without a host. The other discovery is that the adult tick is practically restricted to domestic animals, while the immature stages live practically only upon certain small wild mammals which never carry the adults. The first of these discoveries made it evident that any plan of starvation, such as is practiced with the tick which transmits Texas fever of cattle, is entirely out of the question. The other discovery, however, at once indicated a feasible line of attack. Since in the vast majority of cases the adult never develops upon animals other than live stock, it is unnecessary to pay any attention to the immature stages found commonly upon small wild mammals. By destroying the full-fed females on domestic animals during the spring and early summer, eradication may be accomplished. There are several species of ticks which occur in the Bitter Root Valley, but the only one which need be considered is known as *Dermacentor venustus*. The others occur in so small numbers or are of such peculiar habits that they can not serve as transmitters of the disease in any important way. Since the one tick which shows practical restriction of the adult stage to domestic animals is the only transmitter of the disease which needs to be considered, the eradication of the tick by dipping methods will undoubtedly eliminate the disease from that region.

A general suggestion toward this method of control was made some years ago by the late Dr. H. T. Ricketts, but the work of the bureau has placed the plan upon a certain basis and has made possible certain detailed methods of procedure which will be considered fully in a bulletin shortly to be published. These plans relate especially to the Bitter Root Valley, where 15 or more deaths from spotted fever occur annually, but the same basis for control may be employed in Idaho and other States where the disease is found.

During the investigation an effort was made to educate the people in regard to the tick and the desirability of its control. The interest of the public was sufficiently aroused to cause the erection of a dipping vat at Florence, Mont., by popular subscription.

Work upon the cattle tick was continued throughout the year. In order to complete our knowledge of the effect of different climatic conditions on the tick, experiments to determine the length of the different developmental periods, and particularly the nonparasitic periods, were continued. This information is of importance in the work of eradication of this tick by the starvation or pasture rotation plan. In this work the cooperative arrangements with the Tennessee Experiment Station were continued. Experiments were conducted which throw much light on the relation between rations and tick attack. Additional experiments with feeding sulphur to cattle indi-

cate that the practice is useless and results only in the expenditure of considerable sums without returns.

In addition to the work upon these two disease-bearing species of ticks, the study of a number of other injurious forms was continued with especial reference to control. Among the more important ones are the fowl tick, which practically prevents successful chicken raising in certain sections of the Southwest, and the spinose ear tick, which is an important pest to live stock in western Texas, New Mexico, Arizona, and parts of California, Nevada, and Utah. The biology of about 19 species of ticks, most of which are of economic importance, has been worked out and the information put in form for publication.

SIMULIUM AND PELLAGRA.

On account of the claim made by Dr. Sambon in the early part of 1910 that a species of fly of the genus *Simulium* transmits the disease of human beings known as pellagra in Italy, collections of flies of this genus in various parts of the South were made. The work down to the present time seems to show that there is no connection whatever between the centers of pellagra infection and the localities in which species of *Simulium* are to be found in the greatest numbers.

WORK ON INSECTS INJURIOUS TO STORED PRODUCTS.

In the course of the work on insects injurious to stored products, which has been carried on, as previously, under the direction of Dr. F. H. Chittenden, especial attention has been given to fumigation and other remedies, including the effect of hydrocyanic-acid gas and bisulphid of carbon under different conditions, especially in hot and cold weather. In Texas and at Washington, D. C., in cold weather, it has been found that the gases are comparatively inoperative in low temperatures. Bisulphid of carbon used during a high temperature has been found unusually effective. The investigations have been conducted chiefly in Texas, Kansas, and Oklahoma, and considerable work of a preliminary nature has been done in the District of Columbia in special fumigators, and in cooperation with the Bureau of Plant Industry at Baltimore, Md. The results of remedial experiments with hydrocyanic-acid gas generated from sodium cyanid and with bisulphid of carbon, liberated in a high temperature, have been published. It has been shown that the lesser grain beetle possesses less resistant power to most gases than most of the other stored-product insects; that fumigations in low temperatures, especially below 50° F., are practically ineffective unless an excessively large amount of bisulphid of carbon or of cyanid gas be used, and that under these conditions it is very desirable that about 48 hours be the length of exposure in order to insure killing all insects, even in tight inclosures. It seems that under ordinary conditions and in a temperature of between 65° and 75° F. a general standard of 2 pounds to 1,000 cubic feet for 48 hours or more should be adopted for bisulphid of carbon treatments.

One of the most troublesome insects investigated during the year was the fig moth. Early in the fiscal year an agent was sent to Smyrna to investigate the conditions under which figs coming to the United States become wormy, and on his return experiments were

carried on in a high temperature similar to that of Smyrna in order to determine if the fig moth can be destroyed with a short exposure. The results of the experimental work seem to be that in the temperature which is apt to be encountered in a building especially constructed for fumigation 2 pounds of bisulphid of carbon should be able to penetrate in 24 hours all of the infested figs, provided they are not too closely packed, and kill all or practically all of the contained larvæ. Approximately air-tight fumigators are a practical necessity for the success of any form of gassing or fumigating.

During the year evidence has been obtained of the establishment of a new and dangerous insect pest in California, the broad bean or horse bean weevil, and there is danger of its introduction into other parts of the United States, since it is able to subsist on peas and other leguminous seeds. The same insect has been brought to New York City and other eastern ports and the seed condemned and destroyed. If vigorous measures are not employed to prevent its introduction from California eastward, it may lead to very serious injury to broad beans. The points of infestation in California are limited, and the pest could be stamped out.

The subject of insect damage to peanuts has been taken up during the year, and it has been ascertained that there is a loss from insects to this crop of surely more than a million dollars a year. This investigation is now under way and a preliminary circular covering the subject has been published.

INSPECTION WORK.

The current inspection work of the bureau relates to fruit, seeds, and plants imported by the Department of Agriculture and commercial importations consigned to Washington, either direct or in bond.

Customs advices relating to 63 commercial importations have been received this year, and, so far as possible, these plants have been inspected. There is no law which authorizes such inspection for the District of Columbia, and inspection can only be carried out by the courtesy of the importers. This has sometimes been refused or is often grudgingly given, and at best is without any effort to facilitate or make possible thorough examination. The worst feature of such imported stock is the masses of cheap ornamentals which are brought in and sold by department stores or sold under the hammer by auctioneers. This condition applies to other large cities as well as Washington. During the past year importations of this kind were made by two local department stores and one auction firm. The auction firm in question was courteous enough to allow the department to destroy a lot of young spruce trees imported from Holland, which were badly infested with a European spruce insect, *Lachnus juniperi* Fab., which is not known to occur in the United States.

In the case of the importations of new stock, plants, or seeds by the Department of Agriculture all such material coming to Washington is thoroughly inspected by officers of this bureau, and if need be, is disinfected or destroyed. Furthermore, all the lots of material which the department prepares for distribution are again inspected, and, if necessary, fumigated, before being sent out. In this way 750 differ-

ent shipping orders have been inspected for the Bureau of Plant Industry, and many of these lots have been fumigated.

In the case of the importations by the Department of Agriculture, this thorough inspection and fumigation is believed to safeguard such material and to reduce to the minimum the likelihood of the introduction of new insect pests.

As illustrating what may be brought in by such material and which in the case of private importers must often escape detection, it may be noted that more than 20 different pests have been intercepted on the importations by this department, many of these new to this country and with very unpleasant possibilities. These include such things as weevils infesting seeds; grasshoppers with wild grasses; grain insects; the mango weevil; a moth reared from mango seeds; scale insects; aleyrodid species (insects related to the white fly); a peach-seed weevil from Siberia, *Anthonomus druparium*, already a very injurious pest in Europe, and one which if introduced into this country will probably be even more destructive than the plum curculio; a cecidomyiid (related to the Hessian fly) on lotus introduced as a fodder plant; several scale insects; eggs of a leafhopper in cuttings of persimmon and peach from China. The last, judging from its relationship to known pests, is capable of very great destruction to all sorts of orchard and ornamental trees. The eggs in this case are inserted under the bark, and to the ordinary observer would pass absolutely unnoticed.

The record of importations of new pests given above is the best possible argument for the passage of a national plant quarantine and inspection law.

THE NECESSITY FOR A NATIONAL QUARANTINE AND INSPECTION LAW.

In the last two annual reports the need of a Federal law which would give some reasonable control over the importation of plants and seeds has been urged, and the risk we are now running every year of bringing in new and dangerous insect pests or plant diseases with such importations has been pointed out. The efforts to obtain control legislation have not so far been successful, largely owing to opposition of the legislative committee of the National Nurserymen's Association, who were fearful that obstacles would be put on the import nursery business.

The bill which was drafted and submitted to the last Congress was a compromise with the nurserymen, in which the wishes of the latter were acceded to wherever possible. At their instance examination was provided for at the point of destination on the premises of the importer, instead of at port of entry, thus meeting the main objection which the nurserymen had had to the bill. A number of other changes were also made, at their instance; all the important ones, in fact, except the elimination of the power of establishing foreign quarantine against particular plants to keep out diseases or insect pests which could not otherwise be excluded. To state this provision indicates its absolute necessity. It is aimed particularly at such dangers as the potato-wart disease and the white-pine blister rust, which no inspection or disinfection would reach, and it would seldom apply to the regular import trade in seedling nursery stock.

As thus amended the bill was introduced during the concluding session of the last Congress and was favorably reported from the Agricultural Committee of the House, but, owing to the legislative conditions of that session of Congress, it was not possible to have it brought up in regular course and given adequate discussion. Near the close of the session it was brought up on the unanimous consent calendar, but no opportunity was possible in the few minutes allowed for debate to present the merits of the measure, and it failed to secure the necessary two-thirds vote to pass it under suspension of the rules.

A new measure has been drawn by the Solicitor of the Department of Agriculture, in conference with the different bureaus interested and with State officials representing various States most affected by the import nursery trade, and has been introduced in both the Senate and House of the present Congress (S. 2870 and H. R. 12311, 62d Congress, 1st session). The chief point of divergence from the bill of last year is that inspection of imported nursery stock is to be left to the different States instead of being undertaken by the Federal Government. A complete system of notification is arranged for, however, both by requiring a permit previous to importation and by subsequent advices to be given by the customs officer, the broker, or first receiver of the stock, and the common carrier transporting it. The features of the bill relating to foreign and home quarantine remain much as before.

The need for this legislation is just as urgent as ever. Fewer brown-tail moth nests were received on imported stock during the season just ended (1910-11), largely owing to the agitation in this country and the more strict supervision by foreign governments, and doubtless particularly to the natural fluctuation in the numbers of this pest abroad. These nests are, however still coming in, some 100 nests having been reported as received in New York State and 2 in Ohio. Reports have not been received from other States. The danger from this condition is perhaps even greater than when the nests are coming in more abundantly. The infrequent finding of these nests will naturally lead to a laxity of examination and result in an even greater risk of the passing of infested material.

The department's connection with the work is the same as before. The voluntary reports received from the customs officers and the railroad companies have been transmitted to inspection officials of the several States. These reports are by no means complete, and can not be complete under existing conditions.

The inspection notices sent to this bureau by the customs officials at the various ports of entry for the last fiscal year (July 1, 1910, to June 30, 1911) indicate over 6,000 different shipments and some 90,000 separate parcels. This, however, includes bulbs, orchids, and greenhouse stock, as well as nursery stock proper. The total annual value of all plant importations in recent years has been a little over \$2,000,000, and the latest customs statistics available indicate that less than one-fourth of this relates to nursery stock, namely, trees, shrubs, and ornamentals, including seedlings. Roughly, therefore, one-fourth of the total number of shipments should be subject to careful examination. The standard trade in greenhouse materials and bulbs is subject to comparatively little risk of introducing new dangerous pests.

One of the worst features of the situation is the importation by department and 5-and-10-cent stores of foreign ornamental nursery stock, which very often is not reported, and which State inspectors have the greatest difficulty in tracing. Nursery stock from abroad is also sent to this country to be sold under the hammer at various auctioneer establishments in large cities, and in both of these cases it is almost impossible to trace such stock or make any adequate inspection of it. In this city, such stock has been examined by agents of this bureau under difficulty and without any real authority, and has in several instances been found infested with dangerous insects.

The record given elsewhere under the head of "Inspection work" of this bureau illustrates more pointedly the dangers which the introduction of foreign stock without proper supervision has for this country.

WORK IN BEE CULTURE.

The principal work in bee culture, carried on under the direction of Dr. E. F. Phillips, has been the study of bee diseases, both as to cause and remedy, and the further study of the extent to which these diseases are spread in the United States. The study of the causes of the two principal diseases has been continued in a satisfactory manner. *Bacillus larvæ*, the cause of American foul brood, has been further studied, and in case of the European foul brood the search for the cause has been continued faithfully and vigorously, but so far without entire success. While the cause for the disease has not been established, there is reason to suspect an organism which has so far failed to grow on any culture medium. Other organisms found in diseased material are being studied as an aid for laboratory diagnosis. The claims of other workers as to the cause of the disease known as European foul brood have not been substantiated. As an aid to other workers in the field, directions for the laboratory diagnosis of samples of suspected brood are being prepared.

A paper summarizing the more important publications on the etiology of bee diseases has been prepared and submitted for publication, and a Farmers' Bulletin on the symptoms and treatment of bee diseases has been published and is being widely distributed. This bulletin contains the available information which a bee keeper should have to control these diseases successfully. The treatment advocated by the bureau is proving very successful where properly applied.

But the greatest task has been, not to prepare the bulletins in question, but to ascertain more about the occurrence and the results of these diseases. No other line of investigation connected with bee-keeping compares with this one in practical importance. During the past fiscal year 1,054 samples of diseased brood have been examined as against 620 for the previous year and 280 for the year before that. A publication giving the distribution as known from samples examined up to March 1, 1911, has been issued, and since that time samples have been received showing the presence of American foul brood in 41 additional counties and European foul brood in 29 additional counties. The records on July 1 showed American foul brood in 335 counties in 39 States and European foul brood in 194 counties in 25 States. These figures do not, of course, indicate that every apiary in these counties contains the disease, but they show that the

diseases are far more widespread and destructive than was suspected in this country before the work was begun.

Particular attention has been paid to the occurrence of disease in Illinois, Iowa, Michigan, Ohio, and Pennsylvania, since there was especial need of information in these States. The devastation of apiaries which comes to light in this work is surprising. It is frequently difficult to get any information concerning a county other than that beekeeping has been practically wiped out. To obtain samples from the various regions containing disease entails an enormous amount of correspondence and the sending out of thousands of circulars, but the results seem to justify the effort. The sending out of letters and circulars of inquiry is in itself beneficial, since by this means bee keepers are induced to examine their colonies carefully and often find disease where it was not suspected. Their attention is also called to a danger which many do not know to exist and they are thereby put on their guard.

This work has also proved most valuable, since the data gained in this way assist apiary inspectors in their work, and also assist in enabling bee keepers to have inspection laws passed. If bee keepers can get reliable information concerning the character and treatment of brood diseases the loss is naturally greatly reduced.

A protozoan (*Nosema apis*), the reported cause of a supposedly infectious dysentery of bees, has been studied, and it is not considered that it is as yet definitely proved that this organism is the cause of the disease.

Work on the development of the bee has been continued, and studies of the egg have been practically completed.

Cooperation has been entered into with the State entomologist of Maryland in making a survey of beekeeping conditions in that State, and this work has been completed. Cooperative work of a similar character in Pennsylvania has been continued. The expert in charge of apiculture has assisted in the establishment of apiary inspection in Ontario by giving a short course of lectures to the bee inspectors at the Ontario Agricultural College at Guelph. This was considered important for the reason that we need protection against possible importation of diseases from Canada. He also assisted in establishing a course in apiculture at Syracuse University, and represented the bureau at the annual meeting of the National Bee Keepers' Association at Albany and at the meetings of the Michigan and Illinois Bee Keepers' Associations.

UNCLASSIFIED WORK.

As happens every year, a great deal of work has been done in different directions which can not be classified under the main sections. Investigations of pecan insects and of insects injurious to ornamental plants and shade trees have been continued. The bureau has been called upon to give advice in the matter of shade-tree insects from many cities in the country.

As mentioned in previous reports, the work of the specialists of the bureau in the determination of specimens sent in by State entomologists and other workers in practical entomology has been very large. This has occupied a great deal of time, but since it has a very im-

portant bearing upon the work of the State entomologists, teachers of economic entomology, and others engaged in practical work, it not only can hardly be avoided, but it has ultimately a considerable value. During the fiscal year nearly 30,000 specimens were determined for these workers.

The correspondence of the bureau continues to increase, and in addition to correspondence by circulars more than 32,500 letters have been written during the fiscal year.

There has also been a large increase in the publications of the bureau, 75 separate numbers having been issued during the year.

PROPOSED WORK FOR THE FISCAL YEAR 1912.

The main lines of field work against the gipsy and brown-tail moths under way at the close of the fiscal year 1911 will be continued, and in conjunction with the Massachusetts State forester's office and the town authorities an attempt will be made to exterminate the gipsy moth in a belt 10 to 15 miles wide along the western infested border in Massachusetts, and a series of towns along the western and northern borders of the New Hampshire and Maine infestations will receive the same attention. At present there seems to be little hope of preventing the spread to the eastward in Maine. Scouting throughout the suspected territory in all of the New England States will be continued, and the inspection of forest products, and possibly of other suspected material shipped from the infested area, will be continued. In July, during the flight of the brown-tail moth, small forces of men were stationed at several points to examine boats and trains for adult brown-tail moths attracted to the lights of these conveyances, and which otherwise would be taken to points where the insects are not known to exist.

With regard to the importation of parasites of the gipsy moth and the brown-tail moth, the bulk of the importations will be still further reduced, and more careful studies will be made to determine the spread and multiplication of those species already established, and more diligent search will be made for those parasites introduced and liberated which have not yet been recovered. The admirable success of the agent who spent the last half of the previous fiscal year in Italy, which so far exceeded any previous efforts of the kind, indicates that it will probably be desirable to make the same intensive studies and the same careful effort to import parasites not yet established, from one or more favorable points.

With the boll weevil, the experiments to determine the feasibility of some plan for its control other than the burning of the plants in the fall will require a large amount of attention, and this investigation will be extended to include a number of suggestions that have come to light as the result of previous work. The poison experiments will be continued, as well as the work with the boll-weevil parasites. The results of the winter shipment of parasites from Texas to Louisiana will be carefully followed up. The exact status of the boll weevil throughout the infested area will be determined as usual and agents will trace the dispersion to determine the extent of the summer and autumn flights of the insect. Attention will be paid to the testing of new remedies and machines. More than a score of these means of control are now awaiting tests.

The work against tobacco insects will be continued and expanded, and experiments in the control of the sugar-cane borer will be conducted on a larger scale. The study of the rice weevil will be carried on further, and the work on the Argentine ant and the cotton red spider will also be continued along the same lines as during the previous year.

With forest insects, the demonstration work in the Northwest will be expanded, and a strong effort will be made to secure the cooperation of the timber owners in the South in order to carry on effective work against the southern pine beetle.

With deciduous fruit insects, several of the investigations recently begun and already indicated will be continued. Codling-moth studies are planned for the Southwest in addition to the work in the Allegheny Mountain region. The plum-curculio investigations will be practically concluded in the season of 1911. A specific study of the insect enemies of nuts on the tree will be begun in the South and will be later extended to the Pacific coast. Work on the woolly apple aphid and the apple-tree borers will be given considerable attention, and if practicable it is planned to begin a specific study of the insects damaging nurseries and of the efficiency of hydrocyanic-acid gas fumigation as practiced by nurserymen on deciduous fruit-tree nursery stock. The grape *Phylloxera* investigations will be continued, and more demonstration work will be given to the pear thrips in California.

With cereal and forage insects, the same problems will continue under investigation, and especial attention will be paid to the alfalfa weevil, which continues to spread and for which no satisfactory remedy has yet been found.

With insects affecting vegetable crops, the work of the past fiscal year will be carried on upon practically the same lines.

With insects affecting citrus crops, the fiscal year 1912 should complete the white fly investigation, except in so far as further efforts will be necessary to introduce and establish the parasitic and predaceous enemies of the white fly discovered in central India. The work with different oily, soapy, or other sprays, carried on experimentally and also on orchard or demonstration scale, should be completed during the coming winter. Some special investigations of newly discovered citrus and subtropical pests in Florida will be undertaken, and the investigation of the orange thrips will be continued.

Under the head of "Insects in their direct relation to the health of man and domestic animals," the work on the spotted-fever tick of the Northwest will be concluded in the autumn. The United States Public Health and Marine-Hospital Service has taken up this work at the request of the State Board of Health of Montana and the services of the bureau will be no longer needed. Work on the southern cattle tick and other southern ticks will be continued, however, and such experimental work as can be done with the house fly and mosquitoes will be carried on.

There will be no great innovations in the work on insects injurious to stored products, and the inspection work will be continued as thoroughly as possible in the absence of a national law.

In bee culture, the increase in the appropriation makes it possible to take up certain lines of work which have been much needed. The

investigation of bee diseases will again receive the principal attention of the service and will be enlarged along much the same lines as heretofore, with the addition of further experiments in the treatment of both infectious diseases. Several practical problems, such as the production of comb honey and the wintering of bees, will be begun in the hope of devising better methods as well as to make known generally the best methods now employed. The study of the sense organs of bees will be begun, and a study of wax secretion will be conducted to learn the conditions under which wax is most rapidly secreted and the activities of the bees during comb building.

PLANS FOR WORK RECOMMENDED FOR THE YEAR ENDING JUNE 30, 1913.

It was my intention to recommend a considerable increase in the estimates for this bureau for the fiscal year 1913, but I am understand that it is your desire and the desire of the chairman of the Committee on Agriculture of the House of Representatives that no increases shall be submitted, and I therefore recommend that the estimates for this bureau be the same as those for the fiscal year 1912.

REPORT OF THE CHIEF OF THE BUREAU OF BIOLOGICAL SURVEY.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., October 17, 1911.

SIR: I have the honor to submit herewith a report on the work of the Biological Survey for the fiscal year ending June 30, 1911, with an outline of the work for 1912.

Respectfully,

HENRY W. HENSHAW,
Chief, Biological Survey.

HON. JAMES WILSON,
Secretary of Agriculture.

WORK OF THE BIOLOGICAL SURVEY.

INCREASING THE NUMBER OF NATIVE BIRDS.

During the year circulars have been issued calling attention to the fact that certain of our native birds appear to be diminishing in numbers. This applies particularly to game birds, but it is true also of some of the more valuable insectivorous species and of shore-birds. Moreover, it is doubtful if, taking the country as a whole, any of our native species are increasing, except perhaps in restricted localities. This is the more deplorable, inasmuch as now, more than ever, there is pressing need of the services of insectivorous birds to hold in check the constantly increasing numbers of insects imported from abroad or that cross our borders from adjacent territory. As these destructive foreign insects are rarely accompanied by the enemies which check their increase in their native habitat, they soon multiply till they become veritable pests. Nature has provided in this country a sufficient number of species for the work of keeping insects in check, including the various swallows, flycatchers, thrushes, woodpeckers, sparrows, and others, and it remains for us by vigorous and concerted effort not only to protect the useful species, but to enable them to so increase that their warfare against the insect hosts shall be thoroughly effective. This can best be effected in four ways:

(1) By providing artificial nesting sites for the species that nest in hollow trees or in the cornices and cavities of buildings. To some slight extent this is already being done in this country, but to obtain appreciable results provision must be made on a much larger scale. It is well within the capabilities of the average farmer boy, when furnished with a few necessary tools, to make nesting boxes for some

of our most valuable species, as bluebirds, swallows, wrens, and woodpeckers. When put up near the farmhouse these not only serve to attract birds and provide for their increase, but add much to the interest and pleasure of the household. The making of artificial nesting boxes has become an established industry in Germany, where the need of increased numbers of insectivorous birds for the protection of the forests was clearly perceived, and they are beginning to be put on the market in this country.

(2) By planting thickets of berry-bearing trees and shrubs along the roads or in waste places on the farm, which will provide not only food but also nesting places and refuge resorts from nocturnal enemies of the birds. On many farms it is necessary only to preserve and encourage clumps of native trees and shrubs already grown and thrifty, but where such do not exist the little time and outlay required for setting out and caring for these bird reserves will be richly repaid by the results.

(3) By carefully protecting the birds already occupying the premises. Present sentiment for the preservation of insectivorous birds is already strong in most parts of this country, and the chief need of protective laws is to insure the safety of our birds from foreign immigrants who, having been accustomed at home to kill for food any and all kinds of birds, large and small, young and old, naturally assume the same privileges in their adopted home. In some parts of the country, moreover, such birds as robins, bluebirds, nighthawks, killdeers, flickers, and other valuable species are slaughtered for food in vast numbers by our own citizens, either ignorant or careless of the fact that the country can ill afford to lose the services of these insectivorous species. The quail and prairie chicken are favorite and legitimate objects of pursuit by sportsmen, but they have been so ruthlessly pursued that they are now generally scarce and in many localities practically extinct. As the bobwhite is a most efficient weed destroyer, to say nothing of its being an active insect hunter, the farmer is called on to decide whether this bird is not too valuable on his farm to be shot for food or sport.

(4) By supplying water for birds. Though at first thought it may seem a small matter, a supply of water for drinking and bathing purposes is of great importance to birds. Running water is, of course, preferable, but shallow vessels distributed over the premises at short intervals in which a supply of water can be constantly renewed will be found to attract great numbers of birds and induce them to make their homes there.

WOODPECKERS.

From an economic standpoint our native woodpeckers may be divided into two classes. The first comprises the bulk of the family and includes upward of 50 species. All of these render extremely valuable service to the farmer, the horticulturist, and the forester. Specially equipped by Nature for digging into wood, they supplement the service of other species and destroy vast numbers of insects inaccessible to other birds.

The second class comprises four species whose range collectively extends across the United States from ocean to ocean. These are

properly known as sapsuckers, for the reason that they excavate holes in the bark of trees for the purpose of obtaining their favorite food, which is the inner bark and the sap that exudes from the wounds. The injury thus inflicted on old trees is usually not so great as to affect their vitality seriously, but sapsuckers often cause the death of young trees. Moreover, after many years the timber from trees attacked by them reveals stains and defects which often materially lessen the value of the finished product. It is estimated that the damage to timber caused by these birds in the United States amounts to more than a million dollars annually. During the year bulletins were issued on both groups of woodpeckers, based on stomach examinations of many individuals and on extended field observations. The main purpose of these publications is to acquaint farmers and others with the part the several kinds of woodpeckers play, so as to enable them to distinguish friends from foes. Methods of protecting trees attacked by sapsuckers are given.

BIRDS OF ARKANSAS.

During the year an assistant of the bureau studied the birds of Arkansas and made careful observations of their habits. With the data thus obtained as a basis, a list of the birds of the State has been issued, no adequate list having previously been printed. In this list are recorded all the data resulting from the field work of the survey and all the information that could be gathered from other sources, with notes on the habits of the birds, especially in regard to their economic relations. We thus have for the first time an excellent idea of the avifauna of this important agricultural State.

FOOD OF WILD WATERFOWL.

The marked decrease in the number of our wild fowl in the last decade has attracted attention in every part of the country and caused much concern not only to sportsmen but to State authorities interested in the conservation of our natural resources. It is evident that increasingly stringent laws shortening the open season, prohibiting spring shooting, and decreasing the bag limit will materially aid in the preservation of the fast diminishing numbers of our waterfowl. The above measures may well be accompanied by action of the several States in setting apart suitable lakes and ponds for bird refuges where migrating waterfowl may safely resort and when so inclined may breed. Another important measure is the planting in suitable waters of native plants adapted to the varying taste of the more important kinds of ducks and geese. During the year investigations of the food of ducks and geese were continued, and field work in connection with these important investigations was done in Arkansas, Tennessee, Texas, Louisiana, and Florida. Many of the important winter feeding grounds of ducks and geese in these States were visited, and the feeding habits of the various species were carefully studied. A preliminary circular on the food of waterfowl was issued with a view of awakening interest in the subject and of supplying practical information in response to the many letters of inquiry from various parts of the United States.

EPIDEMIC AMONG WILD DUCKS AT GREAT SALT LAKE.

Following a long dry season, which favored the rearing of a large number of wild ducks, but materially reduced the area of the feeding ponds, resulting in great overcrowding, a severe epidemic broke out about August 1, 1910, among the wild ducks about Great Salt Lake, Utah. Dead ducks could be counted by thousands along the shores and the disease raged unabated until late fall. Shooting clubs found it necessary to declare a closed season. Some of the dead ducks were forwarded to the Biological Survey and were turned over for examination to the Bureau of Animal Industry, by the experts of which the disease was diagnosed as intestinal coccidiosis.

Various plans of relieving the situation were tried: The irrigation ditches were closed, thus providing the sloughs and ponds with fresh water, and lime was sprinkled on the mud flats and duck trails. Great improvement followed this treatment, and experiments proved that ducks provided with abundant fresh water and clean food began to recover immediately. These methods promised success, but later it was proposed that the marshes be drained and exposed to the sun's rays—a course which can not be recommended. That coccidia are not always killed by exposure to the sun is shown by their survival on the sites of old chicken yards. An added disadvantage of the plan is that draining and drying the marshes would have a bad effect on the natural duck foods and upon the birds themselves.

ALFALFA WEEVIL.

The recently imported alfalfa weevil threatens to add a very injurious insect pest to the many existing in the United States. Already seriously destructive in Utah, should the insect continue to spread it is likely to endanger the alfalfa industry throughout the Western States. The Biological Survey is cooperating with the Bureau of Entomology in investigations to devise means of checking the spread of the weevil. Preliminary work has already shown that a number of birds feed on the insect, and it is hoped to spread this information among the farmers and so secure their aid in furthering measures for the protection and increase in numbers of these particular species.

GROUND SQUIRRELS.

During the year field investigations and experiments were continued to discover better methods of destroying ground squirrels in the National Forests and elsewhere. In order to test the efficacy and cheapness of the strychnine-starch solution recommended in Circular No. 36, several demonstrations on a rather extensive scale were undertaken in California. The Kern County Land Co., of California, under the supervision of the Biological Survey, successfully treated 29,000 acres of alfalfa with poisoned grain for the purpose of exterminating ground squirrels over the area. At the Jesus Maria Rancho an assistant of the Biological Survey supervised the destruction of ground squirrels over about 25 square miles of range lands and practically exterminated them at a cost of about 4 cents an acre. In winter, experiments were carried on in the San Joaquin

Valley for the purpose of finding a bait for use in the winter or wet season as effective as the strychnine-barley bait in the dry season—so far, however, without success.

RODENTS IN RELATION TO REFORESTATION.

Cooperative work with the Forest Service was continued during the year to devise methods of preventing the destruction of seeds in reforesting enterprises in the National Forests. Experiments were conducted in the Black Hills Forest of South Dakota, the Pike Forest of Colorado, the Pecos Forest of New Mexico, and the Coconino Forest of Arizona. The only practicable means to insure the safety of newly grown or planted seed was found to be the destruction of the small rodents infesting the tract. This is best done by means of poisoned bait prior to the seeding. Whether the same methods and same bait will prove as efficacious elsewhere as in the Rocky Mountain regions remains to be determined, but it is believed that by the methods set forth in Circular No. 78, "Seed Eating Mammals in Relation to Forestry," the loss during reforesting operations in the Rocky Mountain region can be reduced to a minimum.

PRAIRIE DOGS.

Prairie dogs still continue to be a pest in certain States, and in regions where new land is being brought under cultivation sometimes render successful crop raising by farmers of small means impossible. They also indirectly cause great loss to stockmen by eating forage plants and thus limiting the number of cattle that can be carried on a given range. In cooperation with the Forest Service it is hoped eventually to exterminate these pests within the National Forests. Until, however, the several States take concerted action looking to the destruction of all prairie dogs within their boundaries, there can be no permanent diminution of these pests and no final abatement of the damage they cause. The preparation and sale to the farmers by the State experiment stations, or other authorized agencies, of poisoned bait at cost would greatly stimulate the work of ridding agricultural and pasture lands of the rodents. During the year demonstration work was carried on in Montana, Wyoming, California, New Mexico, Arizona, and Kansas with the starch-barley preparation, which appeared to be exceedingly effective with these animals even where there is green forage. Notwithstanding the fact that the animals are partial to oats, in some cases barley has been found to be a more effective vehicle for poison, as the hull which carries the poison can not be so easily removed.

MOLES.

That moles do much damage to lawns has long been known, and in addition farmers often charge them with the destruction of potatoes and other crops; but until recently the mole has not usually been classed among noxious animals, since it has been assumed that its food consists almost exclusively of insects and earthworms. Recent investigations show, however, that while the animal does much good

by destroying insects it also attacks crops to some extent, especially seed corn, although much of the damage attributed to this animal is due to field mice, which habitually use the runways of the moles. Efforts are being made to secure the stomachs of moles from different agricultural sections of the country with the view of increasing our knowledge of the food habits of this little mammal, and a bulletin will be issued defining its economic status and explaining methods of destroying it when necessary by traps and poisons.

FUR-BEARING ANIMALS.

The present high price of furs is due less to passing fashion than to the actual and growing scarcity of fur-bearing animals. As wearing apparel and for personal adornment furs occupy a place of their own, and there seems to be no acceptable substitute for them. For years the demand for furs has been greater than the supply, and, chiefly as a result of the encroachments of civilization on the breeding range of the animals and the unceasing activity of trappers, the number of fur bearers has been greatly reduced. If in the future furs are to be worn by any but the rich, it would seem that recourse must be had to fur farming on a large scale. The fur bearers best adapted for artificial breeding appear to be foxes, minks, and martens. Attempts to raise these animals, especially the first two named, are being made by private parties in various parts of this country and Canada. So far none of these enterprises appear to have passed the experimental stage, although a number of breeders of the silver fox claim to have made the business remunerative. It is believed that under suitable climatic conditions and with a fair understanding of the nature and methods of the business, the rearing of foxes and minks, and perhaps also martens, can be made a permanent and profitable occupation. The experiments now under way are being watched with great care, and all possible information is being obtained from breeders as to the treatment and feeding of the animals, with a view of ultimately issuing bulletins on the subject to supplement the two already published on fox farming and the muskrat industry.

COOPERATIVE WORK IN RELATION TO SPOTTED FEVER.

In cooperation with the Bureau of Entomology and the State experiment station of Montana much work was done by the Biological Survey during the year in Bitterroot Valley, Mont., to determine which of our native mammals act as hosts of the fever tick and thus aid in spreading spotted fever. In one or another stage of development fever ticks were found on no fewer than 18 of the wild mammals of the district. Some of these, like the larger game animals, are so scarce and inhabit places so remote from the habitations of men that they probably have little to do with the spread of the disease. Others, however, particularly ground squirrels, woodchucks, pine squirrels, and chipmunks, are very numerous in both cultivated and waste places contiguous to farms and villages, and any plan for permanently freeing the valley from fever ticks necessarily involves the extermination or the material reduction in numbers of these mammals. Thorough investigations are now being made by one of

the assistants of the survey with the view to discover effective methods of ridding large tracts of the above and other tick-carrying animals. A prime requisite of such methods is cheapness, since, while in its most virulent form the spotted fever is confined to a comparatively small area on one side of the Bitterroot Valley, the disease in milder form is distributed over thousands of square miles in the Rocky Mountain region, including parts of several States.

To disseminate the information thus far obtained and to aid in the study of the disease, a circular has been published and distributed giving a list of the wild mammals living in and around the valley and indicating the species which are known to act as hosts of the tick.

CRAWFISH IN RELATION TO AGRICULTURE.

In certain sections of the South crawfish exist in very great numbers, especially in Mississippi and Alabama, where there is a single tract of more than 1,000 square miles where the raising of cotton and corn is rendered difficult and in places unprofitable by these crustaceans, which devour the young and tender plants. Some idea of the numbers of crawfish may be gained from the statement that in badly infested areas there are from 10,000 to 12,000 holes to the acre, each hole being made by a single crustacean. Investigations and experiments made on the ground show that at a comparatively small expense it is possible to practically free a given tract from the pests by the use of carbon bisulphid, two or three drops to a hole, and by employing men to kill the crawfish when they emerge on rainy mornings or evenings to feed. A circular on the subject describing the habits of the animals, so far as they concern the planter, and suggesting methods of killing them by means of chemicals is in course of preparation, and when published will be freely distributed in the sections where crawfish are troublesome.

BIOLOGICAL INVESTIGATIONS.

Field work during the year was carried on in Alabama, Arkansas, Idaho, Kentucky, Montana, Tennessee, Wyoming, and Virginia.

The final report on the biological survey of Colorado has been published. It includes description of the life and crop zones of the State, with a zone map; also a full list of the mammals, with important contributions to our knowledge of their abundance, distribution, and relations to agriculture.

The biological survey of New Mexico also has been finished, and final reports on the life and crop zones, with a zone map, and full reports on the mammals and birds, are nearly complete.

The biological surveys of previously unworked parts of both Idaho and Montana have been made as part of the general survey of these rapidly developing States. A previously unknown species of ground squirrel was found to be abundant in Idaho. The animal is of considerable economic importance, owing to the damage it does to crops throughout some of the best farming country.

The biological survey of the lower Mississippi Valley region has been continued, and a report on the birds of Arkansas, including notes on distribution areas and a map of the life and crop zones, has

just been issued. This is the first of a series of reports upon this region, which will be issued as rapidly as possible.

In addition to the area just named, work has been done also in Kentucky, Louisiana, and Tennessee. The results obtained will be incorporated as rapidly as possible into final reports on the region. The biological survey of Alabama is under way, and will be pushed to completion as quickly as practicable. The field work of this branch of the biological survey in the lower Mississippi Valley is of special value at the present time, owing to rapid agricultural development and the necessity for studying the habits of the birds and mammals found there, since many of them are of marked economic importance.

Office work, making available the vast amount of information collected during the years of field work of the Survey, has advanced satisfactorily. Great progress has been made in mapping the distribution of both birds and mammals, thus placing these data in shape to be of direct service in the States covered by the various species. These maps are being issued in connection with various publications.

Large additions have been made to the great store of information already accumulated concerning bird migration; also concerning the distribution and habits of birds. Bulletins have already been published on the distribution and migration of warblers, waterfowl, and shore birds. Another bulletin is now in preparation on the distribution and migration of herons and ibises.

A monograph on wood rats of the genus *Neotoma*, a group of widely distributed rodents, which occur from coast to coast in the United States, has been published, giving a description of the species and their distribution. Many species are of more or less economic importance, and one has harbored plague-infected fleas.

A report upon the muskrats has been published, giving descriptions of the known species in North America, with a brief account of their range, habits, and character, and the value of their fur. While individually insignificant, these mammals are collectively among the most valuable fur bearers, and they are worthy of careful protection.

A report on spiny pocket mice (*Heteromys* and *Liomys*) has been issued. These animals occur along our southern border, and, like other pouched rodents, are more or less injurious to crops wherever they occur in cultivated areas.

During the first part of the year a biological reconnoissance was made across the northern part of British Columbia with special reference to the distribution of the species of birds and mammals occurring also within our territory to the north or south. This work was done at small expense to the Survey through the generous co-operation of Mr. George Mixter. A report for publication upon the work is in course of preparation.

An elaborate report on the birds of Texas is well advanced toward completion and should be ready for publication during the coming year.

During the summer of 1910 the Smithsonian Institution undertook the organization of a biological survey of the Canal Zone. This was considered to be of such great and immediate interest that the Presi-

dent approved the plan to have specialists from various bureaus detailed to the work. In cooperation with the Smithsonian Institution the Biological Survey has charge of the investigation of the mammal and bird life of the zone, and has already secured very interesting and valuable results.

Throughout the year large numbers of specimens have been identified for colleges, experiment stations, and individuals. The classification of the data in our files, as well as the preparation of the maps showing the distribution of the birds and mammals, is of great value in connection with the study of the economic relation of the species and as a basis for laws for the protection of useful kinds and the destruction of noxious ones. As the files are being brought more and more nearly up to date, this information becomes increasingly useful.

IMPORTATIONS.

Although the restrictions on importation imposed by the Lacey Act are widely known, efforts to import objectionable birds and mammals continue and require constant watchfulness.

The usual supervision of the importation of birds and other animals required by section 241 of the United States Criminal Code has been maintained. Five hundred and nineteen permits have been issued and 123 of the consignments have been inspected by the regular inspectors of the Biological Survey stationed at New York, Philadelphia, and San Francisco. Under these permits there have been imported 450,946 birds and 4,063 mammals. Of the birds 345,210 were canaries, 13,398 pheasants, 36,507 European partridges, 5,994 miscellaneous game birds, and 49,837 miscellaneous nongame birds. In addition 24,318 birds and 1,364 mammals requiring no permit were admitted to entry, making the total entries during the year 354,858 canaries, 13,398 pheasants, 36,507 European partridges, 6,163 miscellaneous game birds, 64,338 miscellaneous nongame birds, and 5,427 mammals. Thirty-two permits were issued at Honolulu, under which there were entered 63 birds, 7 mammals, and 3 reptiles. Of the pheasants 12,326 were English ringnecks, imported for stocking game covers, and the rest miscellaneous species, including two of the rare Argus pheasants, which are brought in chiefly for aviary purposes. European partridges showed an increase of 93 per cent over last year's importation. The importation of quail from Mexico reached 3,110 as against 1,246 in 1909-10. The Formosan teal was apparently first imported into the United States August 2, 1909, and 178 entered the United States before July 1, 1910, and 146 more during the current year.

Among miscellaneous nongame birds five of the greater birds of Paradise were probably the first living individuals of this species ever brought in, although the skins of these beautiful birds are very popular for millinery. Interesting also is the entry on May 31 of four barbets (*Trachyphonus cafer*), apparently the first importation of this striking species. Of the Shama thrush, one of the most attractive songsters of India, 237 were brought in, as compared with 231 last year, and of the beautiful Lady Gould finches of Australia, 273, as compared with 460 last year. As a result of overstocking the market, importation of the Indian yellowhammer fell from 1,945

in the first half of the calendar year 1910 to 204 during the entire fiscal year just past.

There was a decrease of 23 per cent in the number of mammals imported, as compared with last year. Among those entered especial interest attaches to the importation of 6 musk oxen, brought from the Arctic by Mr. Paul J. Rainey, for the New York Zoological Park.

Late in 1910 information was received of a mongoose and two flying foxes on exhibition at Kansas City. These were placed in zoological parks. Three mongooses brought to New York from Cienfuegos, Cuba, February 23, 1911, were not allowed to land, but were killed on board ship.

Notable progress was made on the card index of importations. Entries of game birds were brought down to date and the importations of game birds during the first 10 years' operation of the law requiring permits from this Department were tabulated.

GAME PROTECTION.

As the settlement of the country progresses, the preservation of its game becomes more and more difficult, not only because of the increasing number of sportsmen, but because of the steady encroachment by settlers upon the breeding places of wild game. It is becoming apparent that even should all the markets be closed and the sale of game prevented, depletion must continue to follow the rapid conversion of the wilderness. The question of preserves for game and for birds—safe and suitable spots where they can multiply in security from the gun and under natural conditions—is therefore becoming increasingly important. In this country it is gratifying to note that game preserves, both public and private, have greatly increased in numbers, while here and there tracts are beginning to be devoted to nongame birds.

BIRD RESERVATIONS.

On April 11 a new bird reservation was set apart by Executive order in northern California, on Clear Lake Reservoir site, a few miles southeast of Klamath Lake, thus increasing the total number of reservations to 52. An additional warden was appointed for the Breton Island Reservation, and changes were made in the wardens located at Malheur Lake, Pine Island, Dry Tortugas, and the three reservations along the Washington coast. An inspector was appointed for the Cold Springs Reservation, in Oregon, and for Deer Flat and Minidoka Reservations, in Idaho, and at the beginning of next year another inspector will be chosen for the Flattery Rocks, Quillayute Needles, and Copalis Rocks Reservations, in Washington.

The prosecution under the immigration laws of the employer of the 23 Japanese poachers arrested on Laysan and Lisiansky Islands in January, 1910, was concluded early in the fiscal year, the court holding that no sufficient case had been made against him. Despite this decision, it is believed that the arrest of the poachers and the seizure of the plumage will suffice to prevent recurrence of similar acts of trespass on islands in the Hawaiian Reservation. In the trespass case on the Mosquito Inlet Reservation the defendants pleaded guilty and paid small fines.

Two cases of trespass required consideration—one on the Deer Flat Reservation, Idaho; the other on the Tortugas Reservation. It has been the policy of the Department to secure the cooperation of residents adjacent to reservations rather than to incur their enmity through rigorous measures, but in the Deer Flat case the violation was so flagrant that prosecution was deemed necessary. In the other trespass case the offenders were fishermen, probably from Habama, who landed on Bird Key, in the Tortugas Reservation, during the winter and stripped the warden's quarters of everything portable, including the lumber and other materials for repairs and improvements. The matter was brought to the attention of the Secretary of the Navy, who directed the commandant of the naval station at Key West to warn fishermen and others not to land on the Tortugas Reservation.

Under the usual permission to trap on Lake Malheur and Klamath Lake Reservations the wardens report the following number of fur-bearing mammals secured during the season: Malheur Lake, 2,456 muskrats and 31 minks; Klamath Lake, 8 skunks, 5 otters, 12 raccoons, 213 minks, and 7 weasels.

PELICAN ISLAND RESERVATION.—The second nesting on Pelican Island extended from the latter part of May, 1910, to the end of August. When able to fly the young birds left, but in September some returned, and by the middle of the month there were from 2,000 to 3,000 birds around the island. October 17–20 the old birds came and nest building began. The entire submergence of the island for a few days in October, owing to hurricanes and severe storms, drove most of the birds to another island east of the main one. By December 15 the new colony contained 5,000 nests with eggs or young. By April 1, when about half the young had left the reservation, a new flock of birds arrived and began nest building. Several hundred more came in about April 14, and by May 1 a second nesting was well under way. The season for visitors opened January 15, and the colony was inspected by about 35 parties.

BRETON ISLAND RESERVATION.—The appointment of an additional warden for the Breton Island Reservation took effect December 1, 1910. The birds noted during the year on this reservation included 12,000 or 13,000 ducks, mainly bluebills, 1,000 snipe, 2,000 other shore birds, 1,000 Forster's and least terns, and 4,000 laughing gulls.

TORTUGAS RESERVATION.—The existence of the colony of birds on the Tortugas Reservation was seriously threatened by rats. The rodents, which came from an old Norwegian schooner driven aground near the island in 1909, lived largely on crabs in winter, but later in the season destroyed hundred of birds' eggs and killed many young birds. Many of the rats were destroyed, and it is believed that the danger has been averted. The Department of Commerce and Labor instructed the lighthouse keepers at Loggerhead and Garden Keys to cooperate with the warden on Bird Key in preventing the gathering of terns' eggs, through which, in former years, the colony of least terns on Long Key was nearly exterminated.

STUMP LAKE.—Two dry seasons on Stump Lake Reservation have been bad for the ducks, though on July 1, 1910, young gulls were more numerous than ever before. On July 5 a hailstorm killed 95 per cent of the young birds on the reservation and 10 per cent of the adults.

LAKE MALHEUR.—Various questions have arisen on Lake Malheur Reservation concerning the rights and privileges of residents on adjoining land—such questions as cutting hay between the meander line and the shore line, burning tules, grazing hogs on Pelican Island, destroying coyotes, and trapping fur-bearing animals. These questions have been so met as to maintain friendly relations with the residents and secure their cooperation.

KLAMATH LAKE RESERVATION.—Under protection grebes are increasing on Klamath Lake. A trespasser who was shooting ducks from a motor boat was arrested in November by the warden and was fined \$25 by the court. The warden has been commissioned deputy United States marshal for California and Oregon, and during the winter he cooperated with the warden service of California in protecting deer and antelope in the northern part of that State. In winter mule deer, driven by heavy snows out of the mountains of Oregon, repair to the Modoc lava beds, where they, as well as the antelope, are easily killed by lawless hunters. Both species are rapidly decreasing. Under the arrangement made it is hoped to prevent the illegal hunting.

COLD SPRINGS RESERVATION.—The Cold Springs Reservoir, which was completed three years ago, was filled to its capacity this year for the first time. The boundaries of the reservation are 10.3 miles in length, and the water surface is 1,530 acres. Owing to the absence of rushes and green food and the roughness and depth of the water, present conditions are not favorable for nesting waterfowl, and it is not probable that the small number of breeding birds will be greatly increased in the near future. But from September to May this reservoir is a stopping place for thousands of migratory ducks and geese, the latter of which remain all winter. There was formerly considerable duck shooting here, but under the present protective regulations the shooting has ceased.

DEER FLAT RESERVATION.—The Deer Flat Reservoir affords a resting place in the fall migration for large numbers of ducks and many geese, brant, and swans. Indications are that it will be also an important nesting ground for waterfowl in the future. The lake is, however, likely to become a pleasure resort, and as it is only a half hour's ride by trolley from Caldwell, and launches are being introduced, probably some restrictions will be needed.

HAWAIIAN RESERVATION.—Another Japanese vessel having been reported at Laysan Island, the revenue cutter *Thetis* was again dispatched to the island. The commander of the *Thetis* found, however, that the captain of the vessel, apparently ignorant of the arrest of the Japanese left the year before, had called for them, but had returned to Japan, and that no injury had been done to the birds of the island.

A cooperative arrangement was made with the University of Iowa to send an expedition to Laysan Island, through which conditions on the island might be investigated, temporary warden service established in the breeding season, and specimens of the fauna secured for the Biological Survey and the university. The specimens collected for the university will form the basis of a panoramic exhibit of the bird life of the island. The expedition visited Laysan late in April and remained until about the 1st of June. The bureau's representative notes in his preliminary report a marked decrease in the number

of albatrosses since his visit eight years before, due to the work of the Japanese poachers.

SALT RIVER RESERVATION.—Forest rangers on the Tonto National Forest, Ariz., on which is located the Salt River Reservation, will report two or three times a year on the condition of the band of mountain sheep which ranges in the southern part of the Forest.

KEECHELUS RESERVATION.—The Forest Service will cooperate through its forest rangers in enforcing the laws upon the Keechelus Reservation and four others, which are located in National Forests in the interior of Washington.

NATIONAL BISON RANGE.

Two buffalo calves were born on the National Bison Range, in Montana, in September, 1910, and 19 in the spring of 1911. One male and two female buffalo from the Blue Mountain Forest Park, N. H., were presented by the American Bison Society and placed on the range. As no losses occurred during the year, these additions bring the present total of the herd up to 70. Twelve antelope were transferred from the Yellowstone National Park during the winter, four of which died. Seven elk were transferred from Jackson Hole, Wyo., in the early spring of 1911, all but one arriving in good condition.

ALASKA.

On July 29, 1910, new regulations were issued under the Alaskan game law, mainly to afford additional protection to deer and walrus. The hunting season for deer was shortened, a bag limit of eight was imposed, and the sale of venison was suspended during the year 1911. The walrus season, besides being shortened, was moved forward. Five wardens were employed during the year.

Provision was made by Congress for a larger warden service by means of an increase of \$5,000 in the appropriation in the sundry civil bill for warden service in 1912. A special report by the governor on the operation of the game law was published by the Biological Survey as Circular No. 77. Twenty-three permits were issued for collection and export of specimens. The specimens entered comprised one moose, three brown bears, and several packages of birds, eggs, and nests, secured for various museums in the United States and one at Bucharest, Roumania. Under authorization by the governor the following trophies were exported from the Territory: Eleven caribou, 29 moose, 45 mountain sheep, and 31 brown bears.

ELK IN WYOMING.

The appropriation made by Congress for caring for the starving elk in the Jackson Hole region, Wyoming, being immediately available on March 4, Mr. Edward A. Preble, of the Biological Survey, was at once sent to Wyoming to make a thorough examination of the situation. Mr. D. C. Nowlin, recently State game warden, was appointed his assistant. It was found that the State had already purchased all the available hay in Jackson Hole and was feeding as many of the animals as possible. Attention was thereupon turned to other phases of the problem. The conditions causing the lack of food and

the number of elk that perished were investigated; the possibility of securing hay next year was given special attention; the region was searched for sites available for winter refuges for the elk, and the possibility of transferring a number of elk to other localities was considered. Two small herds were transferred to the National Bison Range in Montana and the Wichita Game Refuge in Oklahoma. Careful attention was given to the feasibility of transferring elk to the Medicine Bow Mountains and the Big Horn Range next winter. In short, the Survey has undertaken a thorough study of the elk problem in all its phases, and a preliminary report will soon be published.

INFORMATION CONCERNING GAME.

Advantage was taken of the presence in northern Michigan of a representative of this bureau to secure information of the comparative abundance of deer now and during the past five years, the relative number of hunters in the woods during the hunting season, methods of hunting, character of the warden service employed, the number of deer shipped, the weight of deer, and the comparative condition of the fur market. In June, 1911, Mr. D. C. Nowlin was employed to obtain definite information concerning the antelope in Idaho and Oregon and to find localities in eastern Oregon suitable for elk. On June 1 Mr. A. C. Cooper visited Texas to report upon the location, size, and condition of the bands of antelope in that State and the present efforts to preserve them. The bureau has secured for the first time statistics of the deer killed in Missouri, Montana, and Wyoming during the hunting season and has made important progress in ascertaining the distribution of big game in the National Forests.

The index of game legislation has made notable progress. The indexing of the laws of Vermont, New Jersey, Delaware, South Carolina, Mississippi, Texas, Tennessee, Kentucky, Indiana, and Ohio was completed during the year, and the bureau now has a full index of game legislation of all the States except five of the New England States, New York, Pennsylvania, Maryland, and North Carolina.

Data were collected, as usual, concerning the number and details of fatal hunting accidents.

The customary annual game publications were issued, including the directory of game officials and organizations, the compilation of the game laws in force in 1910, and the summary of progress in game protection in 1910.

COOPERATIVE WORK IN GAME PROTECTION.

One of the most important features of the work of the Section of Game Preservation consists of cooperation with State game officials and private organizations in the protection of game. During the past fiscal year the bureau has cooperated with New York, Virginia, and Missouri in checking illegalities under the game laws; with Louisiana, Delaware, Pennsylvania, Ohio, and Indiana in furnishing information needed; with New Jersey and Wisconsin in conducting civil-service examinations for candidates for deputy wardenships; with New Jersey, also, in introducing quail and deer into its game covers; with Wyoming in solving the problem presented by the con-

gestion of elk each winter in the Jackson Hole region; with the Boone and Crockett Club in securing antelope for the Wichita Game Preserve and the National Bison Range; with the Benevolent Protective Order of Elks in securing elk for the Wichita Game Preserve; with the American Bison Society in locating a suitable site in South Dakota for a new bison range, and with the National Association of Audubon Societies in maintenance of some of the bird reservations.

PLUMAGE.

The Biological Survey has cooperated actively with officials of various States in enforcing the laws prohibiting the sale and possession of certain plumage for millinery. The condition of the plumage traffic of Los Angeles, San Francisco, Salt Lake City, Denver, Kansas City, St. Louis, Chicago, and Milwaukee was investigated. It was found that no heron, aigrettes were being sold in California, and very few in Utah and Colorado; a few were on sale in St. Louis and Kansas City, which were shortly afterwards seized under the game law; a few in Milwaukee, and many in Chicago. The Shea law, passed by the New York Legislature in 1910, went into operation July 1, 1911, and a similar law passed by the New Jersey Legislature in May, 1911, became effective in August, 1911. Each of these laws prohibits the sale or possession of plumage of birds of the same family as any that are found within the State. The desirability of similar legislation will be brought to public attention in other parts of the United States. Through the State Department statistics of the trade in aigrettes throughout the world have been secured, and the bureau will soon publish this information.

The newly appointed plumage expert of Missouri was given the opportunity to study our collection of birds and to consult our ornithological works. Not only has he thus been enabled to do better official work, but he incidentally brought out certain facts of general interest to ornithologists as well as bird protectors.

INTERSTATE COMMERCE IN GAME.

As heretofore the policy pursued in the enforcement of sections 242, 243, and 244 of the Criminal Code of the United States regulating interstate commerce in game has aimed at prevention of violations rather than prosecution.

At the beginning of the sale season for game the most important game markets of the United States—Philadelphia, Buffalo, Cleveland, Indianapolis, St. Louis, and Chicago—were personally inspected by a representative of the bureau and showed fairly general compliance with the law and a notable falling off in the amount of game handled. Investigation of Mississippi County, Ark., an important point of supply, afforded useful knowledge relative to conditions and methods at that point. Evidence of a large number of shipments from Arkansas to St. Louis furnished this bureau by the chief deputy game and fish commissioner of Missouri was carefully reexamined, but failed to disclose any case of sufficient strength to justify prosecution.

It was ascertained that on the coast of Virginia, an important source of supply for the eastern markets, ducks were being netted and

shipped without regard to the State and Federal law. The ten chief offenders were indicted in the United States district court for the eastern district of Virginia. Two were convicted and fined \$200 and costs each and the other cases went over to the November term of court.

A number of violations of the interstate law were referred to the State authorities, and in practically all of them convictions were secured and fines imposed ranging from \$25 to \$50. On information from the New York game officials relative to certain imported foreign game in cold storage in New York City, to be shipped later to Chicago, this bureau informed the Illinois authorities in order that they might take the necessary measures to enforce their laws. Through information given to the authorities of New York concerning certain shipments from other States, an important case of violation of the New York law requiring bonds for stored game was disclosed, and conviction of the offenders with a substantial penalty followed.

OUTLINE OF WORK FOR 1912.

ECONOMIC ORNITHOLOGY AND MAMMALOLOGY.

Work on the food habits of birds and mammals will be continued, including field observations and the examination of stomachs and tabulation of their contents.

Cooperation with the Forest Service will be continued to devise practical methods of protecting tree seeds and seedlings from the attacks of birds and mammals during the reforestation of treeless areas within our National Forests; also in destroying prairie dogs within the National Forests and contiguous areas. Field observations and experiments will be made to devise methods to prevent attacks on orchard and nursery stock by field mice, pine mice, rabbits, and other injurious rodents.

Cooperation will be continued with the Reclamation Service in protecting dikes and fills from the depredations of burrowing animals.

Investigations will be continued to devise methods for preventing the attacks of crawfish on cotton and grain crops in the Southern States.

Field observations will be carried on in Utah and contiguous States to determine the value of birds in checking the spread of the newly imported alfalfa weevil. Investigations into the food of wild ducks and geese will be continued, and a report will be published as soon as possible. Investigations of the food habits of the flycatchers and meadowlarks will be completed and reports published. Study of the food of thrushes and crows will be continued.

Experiments with traps and poisons for the destruction of English sparrows will be carried on.

GEOGRAPHIC DISTRIBUTION.

During the coming year work will be continued on the biological surveys of the lower Mississippi Valley States and of Alabama, also of Montana and Idaho. It is expected that the field work of a biological survey of Wyoming will be completed. It is hoped to complete the field work in California so as to permit the publication of a

report, with map, on the life zones of the State. The biological survey of the Canal Zone in cooperation with the Smithsonian Institution will be continued.

A report on a biological reconnoissance through northern British Columbia will be prepared for publication. A report upon the birds of Texas, now nearing completion, will be published; also a bulletin on the distribution and migration of the herons and ibises.

The preparation of maps showing the distribution of the species of North American mammals and birds, as well as the collection and card cataloguing of information concerning their distribution and habits, will be pushed as rapidly as possible.

GAME PROTECTION.

In addition to carrying on the various projects now under way, attention will be given to a number of new matters. It may be necessary to establish inspection of importations in Porto Rico on account of a law adopted in that Territory early in 1911. It may also be necessary to place restrictions on the importations into the United States of monkeys, to guard against the danger of the introduction of the disease trypanosomiasis.

Operations connected with the enforcement of the Federal law regulating interstate commerce in game will be continued and extended. Many waterfowl are illegally shipped from North Carolina to northern markets, and the practice will be investigated and steps taken to stop it. The passage of the Bayne bill in New York, by closing the markets of New York to native game, will greatly facilitate this work. The shipping of deer and grouse to the Chicago market from Michigan and Wisconsin, in violation of the laws of these States, will be investigated.

Several bird reservations now without warden service or supplied only temporarily will be provided with regular wardens, including probably the reservations in Idaho, Oregon, and Washington, also the Belle Fourche Reservation in South Dakota, and possibly some of the Florida reservations. It is planned also to appoint inspectors for several districts. Efforts will be made to establish a warden service on Laysan Island during next spring and summer and to have the *Thetis* visit the island again next winter. Steps will be taken also to exterminate or at least reduce the numbers of rabbits that now are a pest on the island.

Attempts (unsuccessful last year) will be renewed to secure mountain sheep for the National Bison Range in Montana. In cooperation with the American Bison Society efforts to secure a suitable site in South Dakota for a new bison range will be continued. The preliminary steps have been taken, and early in the new fiscal year an agent will examine the various localities that have been suggested.

The problem of the preservation and restoration of the big game of the country is receiving careful consideration, and several measures will be undertaken during the coming year along that line. Efforts will be made to provide elk for one or two National Forests in Colorado, for the Medicine Bow Mountains in Wyoming, and for various points in eastern Oregon, provided they prove suitable for elk. Through one of the principal associations of sportsmen it is

hoped to introduce elk at one or two points in Arizona, and through the Order of Elks or otherwise an effort will be made to increase the herd of elk in the Wichita Game Preserve. These measures are part of a plan to restock the Rocky Mountain States with elk. The preservation of the antelope is one of the most difficult problems presented. A careful survey of the condition of antelope will be made in two States in the Northwest, Idaho and Oregon, and three in the Southwest, Texas, Colorado, and Kansas, in order to ascertain what can be done to preserve from extinction this valuable and attractive species, the only antelope of the Western Hemisphere. The transfer of big game from points of comparative abundance to suitable localities where it is wanting will be made a special feature of the work of the coming year.

REPORT OF THE CHIEF OF THE DIVISION OF ACCOUNTS AND DISBURSEMENTS.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF ACCOUNTS AND DISBURSEMENTS,
Washington, D. C., October 24, 1911.

SIR: I have the honor to submit herewith a report of the work of the Division of Accounts and Disbursements for the fiscal year ended June 30, 1911.

Very respectfully,

A. ZAPPONE,
Chief of Division.

Hon. JAMES WILSON,
Secretary of Agriculture.

CHARACTER OF WORK.

The Division of Accounts and Disbursements audits, adjusts, and pays all accounts and claims against the department; decides questions involving the expenditure of public funds; prepares advertisements for all work and supplies not contracted for by the General Supply Committee of the Executive Departments; prepares letters of authority; writes, for the signature of the Secretary, all letters to the Treasury Department pertaining to fiscal matters; examines and signs requisitions for the purchase of supplies; issues bills of lading and requests for passenger and freight transportation; prepares the annual estimates of appropriations; prepares annual fiscal reports to Congress; and transacts all other business relating to the financial interests of the department.

ORGANIZATION.

For the purpose of systematizing its work, the division is divided into five sections, as follows:

CASHIER'S SECTION.—This section prepares and mails all checks and handles all moneys received and disbursed.

AUDITING SECTION.—This section audits all salary, reimbursement, purchase, telegraph, and express accounts.

BOOKKEEPER'S SECTION.—This section keeps all books pertaining to the fiscal affairs of the department, indexes all accounts, prepares all requisitions on the Treasury for advances of public funds, compiles for rendition to the accounting officers of the Treasury the quarterly abstracts of expenditures and collections and the account current covering the liability for public funds, and has charge of the correspondence with the accounting officers of the Treasury in the settlement of accounts.

MISCELLANEOUS SECTION.—This section has charge of the preparation of the several annual reports to Congress and the administrative examination of the accounts of the Forest Service and of the Weather Bureau; also audits all accounts of the Board of Consulting Scientific Experts.

FREIGHT AND TRANSPORTATION SECTION.—This section audits all passenger and freight accounts and prepares and issues all passenger transportation requests and bills of lading covering freight shipments.

WORK OF THE YEAR.

APPROPRIATIONS, EXPENDITURES, ETC.

The total appropriations for the department for the year ended June 30, 1911, amounted to \$17,278,976.10, not including \$1,440,000 appropriated for the several State agricultural experiment stations. Of this sum (\$17,278,976.10), \$14,759,292.08 was disbursed prior to the close of the year, leaving a balance of \$2,519,684.02, nearly all of which is covered by outstanding liabilities. Supplemental accounts for the year 1910 were also paid, amounting to \$747,329.26. The unexpended balances for the year 1909, amounting to \$306,336.91, were finally covered into the Treasury on June 30, 1911.

There were received, audited, and paid 62,424 accounts, amounting to \$10,277,119.25 (not including Forest Service). In payment of these accounts 115,802 checks were drawn on the Treasury at Washington and the Subtreasuries at New York and at Chicago.

There were also audited and sent to the Treasury Department for payment 2,969 accounts.

LOST CHECKS.

During the year 71 checks were lost in transit through the mails or by the payees.

REQUISITIONS, LETTERS, AND REQUESTS.

One hundred and eight requisitions were drawn on the Treasury, aggregating \$9,954,606.50 (this does not include Forest Service).

The number of requisitions issued for supplies was 23,741.

The number of letters of authorization for travel was 6,307.

The number of letters written and received in the ordinary transaction of business was about 95,000.

The number of requests for passenger transportation was 35,168.

The number of requests on the Quartermaster General for the transportation of Government property was 551.

The number of departmental bills of lading issued was 3,113.

TEMPORARY SPECIAL DISBURSING AGENTS.

Twenty-six temporary special disbursing agents and nine district fiscal agents were active during the year, and the sum of \$6,166,758.60 from the appropriations of the department was advanced to them, requiring the issuance of 188 requisitions upon the Treasury. The total number of temporary special disbursing agents and district fiscal agents shown includes 10 and 9, respectively, for Forest Service,

to whom \$6,025,884.03 was advanced, requiring 136 requisitions upon the Treasury. All accounts of temporary special disbursing agents and district fiscal agents of the department were given an administrative examination in this division before being forwarded to the Treasury Department for final audit and settlement.

MILEAGE BOOKS.

During the fiscal year 764 mileage and scrip books were purchased for official use by employees of this department, at a cost of \$25,287.50. Rebates on these books, amounting to \$3,113.65, were deposited in the Treasury to the credit of the appropriations.

COMBINED ACCOUNTS.

There were 4,175 combined accounts handled during the fiscal year 1911, and it is estimated that the preparation of at least 20,875 checks was thereby avoided, to say nothing of the saving in clerical labor.

APPROPRIATIONS, DISBURSEMENTS, AND UNEXPENDED BALANCES FOR THE FISCAL YEAR 1911.

The table following shows for the fiscal year the amounts appropriated, disbursed, and unexpended:

Appropriations, disbursements, and unexpended balances for the fiscal year 1911.

Object.	Subappropriations.	Transfer of funds. ¹	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
Salaries, Forest Service.....			\$60,200.00	\$56,599.49	\$3,600.51
Improvement of the national forests.....			275,000.00	243,225.06	31,774.94
General expenses, Forest Service.....			5,572,900.00	5,027,705.50	545,194.50
Fighting forest fires.....	\$135,000	\$1,093,050.00		1,065,081.70	27,968.30
Maintenance and supplies.....	221,040	234,041.47		162,808.00	71,233.47
Forest products.....	129,420	129,620.00		118,685.89	10,934.11
National forest range investigations.....	11,820	11,820.00		9,063.28	2,756.72
Silviculture, national forests.....	66,640	60,275.68		56,313.74	3,961.94
Management of forests.....	108,010	93,750.90		82,417.82	11,333.08
Market and miscellaneous investigations.....	115,470	104,804.85		94,428.30	10,376.55
Paper tests.....	14,000	14,000.00		11,091.80	2,908.20
Absaroka National Forest.....	20,844	18,278.35		16,564.02	1,714.33
Alamo National Forest.....	33,449	20,776.60		19,214.29	1,562.31
Angeles National Forest.....	50,644	55,708.00		50,145.66	5,562.34
Apache National Forest.....	31,414	31,244.98		28,080.07	3,164.91
Arapaho National Forest.....	21,560	19,865.00		18,143.83	1,721.12
Arkansas National Forest.....	32,960	31,755.52		30,658.78	1,096.74
Ashley National Forest.....	19,668	13,581.64		11,881.61	1,700.03
Battlement National Forest.....	15,700	15,314.00		13,961.10	1,352.90

¹ And not to exceed 10 per cent of the foregoing amounts for the miscellaneous expenses of the work of any bureau, division, or office herein provided for shall be available interchangeably for expenditure on the objects included within the general expenses of such bureau, division, or office, but no more than 10 per cent shall be added to any one item of appropriation except in cases of extraordinary emergency, and then only upon the written order of the Secretary of Agriculture.

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Object.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
General expenses, Forest Service—Continued.					
Beartooth National Forest.....	\$17,299	\$17,726.35	.....	\$16,366.35	\$1,360.00
Beaverhead National Forest.....	31,837	21,314.44	.....	18,913.01	2,401.43
Blighorn National Forest.....	32,238	28,087.13	.....	24,861.32	3,225.81
Bitterroot National Forest.....	31,391	29,447.04	.....	26,936.06	2,510.98
Blackfeet National Forest.....	38,159	20,335.86	.....	18,001.46	2,334.40
Black Hills National Forest.....	44,746	50,504.16	.....	44,424.65	6,079.51
Boise National Forest.....	27,925	24,269.12	.....	21,627.45	2,641.67
Bonneville National Forest.....	22,822	22,789.56	.....	20,349.61	2,439.95
Cabinet National Forest.....	21,143	16,642.60	.....	15,312.05	1,330.55
Cache National Forest.....	18,700	17,590.85	.....	15,403.00	2,187.85
California National Forest.....	26,240	26,316.22	.....	21,723.99	4,592.23
Caribou National Forest.....	20,200	15,567.10	.....	13,502.84	2,064.26
Carson National Forest.....	28,971	22,127.91	.....	18,556.86	3,571.05
Cascade National Forest.....	37,280	26,437.66	.....	23,500.47	2,937.19
Challis National Forest.....	21,600	13,311.00	.....	11,491.90	1,819.10
Chelan National Forest.....	42,195	40,173.05	.....	35,368.78	4,804.27
Chiricahua National Forest.....	21,131	15,541.00	.....	13,277.56	2,263.44
Choctawhatchee National Forest.....	9,009	9,909.00	.....	8,871.71	1,037.29
Chugach National Forest.....	17,848	18,048.00	.....	15,893.35	2,654.65
Clearwater National Forest.....	41,105	35,202.28	.....	32,770.69	2,431.59
Cleveland National Forest.....	38,783	38,483.00	.....	30,824.63	7,658.37
Cochetopa National Forest.....	17,704	16,146.13	.....	14,674.66	1,471.47
Coconino National Forest.....	50,226	41,358.77	.....	37,240.10	4,118.67
Cœur d'Alene National Forest.....	45,976	46,511.02	.....	43,734.88	2,776.14
Colorado National Forest.....	19,854	21,046.00	.....	18,969.00	2,077.00
Columbia National Forest.....	23,376	22,875.20	.....	20,853.57	2,021.63
Colville National Forest.....	22,910	22,679.50	.....	20,218.00	2,461.50
Coronado National Forest.....	24,212	14,121.45	.....	12,998.56	1,122.89
Crater National Forest.....	31,369	35,505.90	.....	32,383.41	3,122.49
Crook National Forest.....	27,712	20,034.00	.....	18,689.74	1,344.26
Custer National Forest.....	12,847	14,032.48	.....	12,258.63	1,773.85
Datil National Forest.....	42,903	33,720.77	.....	29,571.57	4,149.20
Deerlodge National Forest.....	41,208	41,519.62	.....	36,564.42	4,955.20
Deschutes National Forest.....	30,463	31,270.15	.....	27,399.21	3,870.94
Dixie National Forest.....	16,600	13,501.00	.....	12,569.97	931.03
Eldorado National Forest.....	11,350	12,485.00	.....	10,924.19	1,560.81
Fillmore National Forest.....	18,730	16,310.00	.....	14,449.39	1,860.61
Fishlake National Forest.....	20,800	14,849.15	.....	13,678.38	1,170.77
Flathead National Forest.....	35,830	37,825.68	.....	36,181.72	1,643.96
Fremont National Forest.....	29,900	25,181.55	.....	22,990.07	2,191.48
Gallatin National Forest.....	26,594	18,520.27	.....	16,638.81	1,881.46
Garces National Forest.....	19,345	11,393.83	.....	9,785.70	1,608.13
Gila National Forest.....	47,484	45,947.09	.....	40,298.13	5,648.96
Gunnison National Forest.....	20,586	18,523.64	.....	16,684.49	1,839.15

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Object.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
General expenses, Forest Service—Continued.					
Hayden National Forest.....	\$16,850	\$15,004.03	.....	\$13,546.85	\$1,457.18
Helena National Forest.....	34,508	33,422.46	.....	28,933.66	4,488.80
Holy Cross National Forest.....	18,610	17,115.84	.....	15,527.25	1,588.59
Humboldt National Forest.....	19,026	20,276.00	.....	17,931.75	2,344.25
Idaho National Forest.....	21,780	15,116.65	.....	13,370.55	1,746.10
Inyo National Forest.....	29,500	22,540.00	.....	19,752.79	2,787.21
Jefferson National Forest.....	34,001	27,290.98	.....	25,216.53	2,074.45
Jemez National Forest.....	31,476	20,186.98	.....	17,905.32	2,281.66
Kaibab National Forest.....	20,400	16,641.78	.....	15,365.43	1,276.35
Kaniksi National Forest.....	28,448	31,204.50	.....	27,923.70	3,280.80
Kansas National Forest.....	8,805	7,432.00	.....	6,305.52	1,126.48
Kern National Forest.....	27,512	26,631.13	.....	23,844.39	2,786.74
Klamath National Forest.....	42,000	31,272.18	.....	27,310.79	3,961.39
Kootenai National Forest.....	30,634	32,080.80	.....	28,837.83	3,242.97
La Sal National Forest.....	13,890	12,934.81	.....	11,413.56	1,521.25
Lassen National Forest.....	31,154	22,322.00	.....	19,024.08	3,297.92
Leadville National Forest.....	29,720	22,384.00	.....	20,314.43	2,069.57
Lemhi National Forest.....	20,750	17,096.27	.....	14,534.32	2,561.95
Lewis and Clark National Forest.....	17,426	15,498.08	.....	14,500.79	997.29
Lincoln National Forest.....	20,218	13,315.00	.....	12,513.51	1,401.49
Lolo National Forest.....	28,952	31,502.54	.....	28,399.60	3,102.94
Madison National Forest.....	24,745	22,827.00	.....	20,683.79	2,143.21
Malheur National Forest.....	24,063	18,547.80	.....	16,488.08	2,059.72
Manti National Forest.....	23,000	20,581.33	.....	18,759.39	1,821.94
Manzano National Forest.....	14,776	10,680.60	.....	9,570.37	1,110.23
Marquette National Forest.....	2,405	1,945.28	.....	1,268.44	676.84
Medicine Bow National Forest.....	28,350	23,709.31	.....	21,474.02	2,235.29
Michigan National Forest.....	3,744	3,825.00	.....	3,220.83	604.17
Minnesota National Forest.....	24,433	19,521.70	.....	17,896.40	1,625.30
Minidoka National Forest.....	17,800	13,908.00	.....	11,999.94	1,908.06
Missoula National Forest.....	34,504	24,599.39	.....	21,999.27	2,600.12
Moapa National Forest.....	3,400	2,886.25	.....	2,456.13	430.12
Modoc National Forest.....	30,890	22,155.40	.....	19,888.16	2,267.24
Mono National Forest.....	23,725	20,778.19	.....	16,738.81	4,039.38
Monterey National Forest.....	15,070	8,370.00	.....	6,393.22	1,976.78
Montezuma National Forest.....	23,440	19,365.42	.....	17,813.03	1,552.39
Nebo National Forest.....	9,300	8,360.15	.....	7,602.70	757.45
Nebraska National Forest.....	18,250	13,987.50	.....	12,954.44	1,033.06
Nevada National Forest.....	20,900	18,195.00	.....	16,129.69	2,065.31
Nezperce National Forest.....	28,507	22,032.00	.....	20,217.65	1,814.35
Ocala National Forest.....	5,623	5,823.00	.....	4,652.00	1,171.00
Olympic National Forest.....	32,925	32,658.12	.....	30,157.59	2,500.00
Oregon National Forest.....	40,882	36,889.42	.....	31,474.88	5,414.54
Ozark National Forest.....	20,961	26,825.06	.....	24,990.53	1,834.53
Palisade National Forest.....	15,550	16,705.00	.....	14,587.12	2,117.88
Payette National Forest.....	20,660	20,722.00	.....	18,433.68	2,288.32
Pecos National Forest.....	29,489	29,937.90	.....	27,367.35	2,570.55

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Object.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
General expenses, Forest Service—Continued.					
Pend d'Oreille National Forest.....	\$27,162	\$28,155.60	.....	\$26,784.63	\$1,370.97
Pike National Forest..	41,280	41,399.83	.....	38,234.75	3,165.08
Plumas National Forest.....	42,012	38,307.00	.....	32,967.52	5,339.48
Pocatello National Forest.....	20,246	15,582.95	.....	14,544.70	1,038.25
Powell National Forest.	16,500	11,630.00	.....	10,150.96	1,479.04
Prescott National Forest.....	33,851	22,983.23	.....	21,311.45	1,671.78
Rainier National Forest.....	36,220	24,462.44	.....	22,079.05	2,383.39
Rio Grande National Forest.....	26,620	27,190.61	.....	25,257.54	1,933.07
Routt National Forest..	22,050	22,299.45	.....	20,967.73	1,331.72
Salmon National Forest.....	29,825	31,090.67	.....	28,581.16	2,509.51
San Isabel National Forest.....	18,070	17,034.89	.....	15,284.61	1,750.28
San Juan National Forest.....	31,458	28,693.34	.....	25,837.06	2,856.28
Santa Barbara National Forest.....	37,889	41,677.00	.....	34,471.95	7,205.05
Sawtooth National Forest.....	27,200	17,423.43	.....	15,665.35	1,758.08
Sequoia National Forest	31,512	25,412.00	.....	20,011.10	5,400.90
Sevier National Forest..	20,550	17,476.06	.....	15,804.97	1,671.09
Shasta National Forest..	38,675	39,952.22	.....	33,844.56	6,107.66
Shoshone National Forest.....	25,220	18,647.98	.....	16,563.53	2,084.45
Sierra National Forest..	49,370	44,165.03	.....	37,697.13	6,467.90
Sioux National Forest..	10,919	11,818.68	.....	10,271.43	1,547.25
Siskiyou National Forest.....	29,561	21,107.41	.....	18,939.95	2,167.46
Sitgreaves National Forest.....	28,074	22,770.00	.....	19,407.02	3,362.98
Siuslaw National Forest.....	23,175	19,481.80	.....	18,002.57	1,479.23
Snoqualmie National Forest.....	30,129	28,851.24	.....	25,462.24	3,389.00
Sopris National Forest..	22,058	18,327.82	.....	16,783.28	1,544.54
Stanislaus National Forest.....	35,788	34,012.81	.....	30,406.28	3,606.53
Sundance National Forest.....	6,029	5,790.00	.....	5,110.96	679.04
Superior National Forest.....	19,379	15,276.00	.....	12,979.52	2,296.48
Tahoe National Forest..	30,886	32,972.22	.....	29,391.21	3,581.01
Targhee National Forest.....	16,850	20,220.00	.....	18,556.31	1,663.69
Teton National Forest..	22,100	11,570.67	.....	10,201.63	1,369.04
Toiyabe National Forest.....	24,000	13,960.00	.....	12,607.03	1,352.97
Tongass National Forest.....	8,300	9,530.00	.....	8,347.54	1,182.46
Tonto National Forest..	33,111	18,200.00	.....	16,550.49	1,649.51
Trinity National Forest.....	36,000	31,393.60	.....	25,864.10	5,529.50
Tusayan National Forest.....	27,214	26,939.60	.....	23,826.43	3,113.17
Uinta National Forest..	28,600	23,657.93	.....	21,372.24	2,285.69
Umatilla National Forest.....	17,200	15,574.38	.....	12,974.04	2,600.34
Umpqua National Forest.....	36,110	31,057.41	.....	26,194.78	4,862.63
Uncompahgre National Forest.....	25,990	20,861.67	.....	19,218.30	1,643.37
Wallowa National Forest.....	33,300	26,033.49	.....	23,189.75	2,843.74
Wasatch National Forest.....	23,450	15,866.69	.....	14,197.90	1,668.79
Washington National Forest.....	31,925	22,866.99	.....	19,951.13	2,915.86
Weiser National Forest..	22,800	18,818.00	.....	16,632.58	2,185.42
Wenaha National Forest.....	19,790	16,055.00	.....	13,133.30	2,921.70
Wenatchee National Forest.....	32,129	22,853.04	.....	20,811.73	2,041.31

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Object.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
General expenses, Forest Service—Continued					
White River National Forest.....	\$19,990	\$20,280.69		\$18,836.53	\$1,444.16
Whitman National Forest.....	26,950	25,478.45		22,673.64	2,804.81
Wichita National Forest.....	10,650	5,850.00		5,100.96	749.04
Wyoming National Forest.....	19,700	17,566.00		15,196.79	2,369.21
Zuni National Forest.....	19,741	11,240.71		9,696.64	1,544.07
General administration, 10 per cent.....			\$472,261.60	436,413.46	35,848.14
SPECIAL APPROPRIATIONS.					
Paper tests, 1911 (sundry civil bill, June 25, 1910).....			30,000.00	26,485.40	3,514.60
Refunds to depositors, excess of deposits.....			65,630.78	57,912.73	7,718.05
Cooperative work, forest investigations.....			14,915.59	10,937.88	3,977.71
National Bison Range.....			3,089.18	2,381.61	707.57
Naval stores industry.....			4.55	4.55	
General expenses, Forest Service, 1911-12.....			70,000.00		70,000.00
Total for Forest Service.....		6,091,740.10		5,425,372.67	666,367.43
Salaries, Department of Agriculture (including Forest Service, but not including Weather Bureau).....			1,267,500.00	1,193,069.54	74,430.46
Officers and clerks.....	1,259,900			1,186,090.73	73,809.27
Extra labor.....	7,600			6,978.81	621.19
Contingent expenses, Department of Agriculture.....			100,000.00	85,792.44	14,207.56
Library, Department of Agriculture.....			15,400.00	10,904.86	4,495.14
Enforcement of the insecticide act.....			35,000.00	6,237.48	28,762.52
National Forest Reservation Commission.....			25,000.00	4.00	24,996.00
Acquisition of lands for protection of watersheds of navigable streams (appropriated \$2,000,000, but \$25,000 in use at time of statement).....			25,000.00	9,964.17	15,035.83
Cooperative fire protection of forested watersheds of navigable streams.....			200,000.00		200,000.00
BUREAU OF ANIMAL INDUSTRY.					
General expenses, Bureau of Animal Industry.....			1,234,540.00	1,043,876.50	190,663.50
Inspection and quarantine.....	623,000	615,800.00 J		527,028.39	88,771.61
Eradicating cattle ticks.....	250,000	243,800.00 W. J ¹ L ¹		201,511.10	42,288.90
Dairy industry.....	147,600	154,600.00 J. L ¹		132,691.03	21,908.97
Animal husbandry.....	42,000	46,200.00 J. W		38,510.78	7,689.22
Diseases of animals.....	108,000			92,732.17	15,267.83
Experimental farm.....	12,000	13,200.00 J		3,346.88	9,853.12
Administrative expenses.....	51,940	52,940.00 J ¹		48,056.15	4,883.85
Cooperative experiments in animal feeding and breeding.....			50,000.00	45,946.39	4,053.61
Meat inspection, Bureau of Animal Industry (permanent appropriation).....			3,000,000.00	2,601,418.96	398,581.04
General expenses, Bureau of Animal Industry, 1911-12.....			65,000.00	10.85	64,989.15

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Object.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
BUREAU OF PLANT INDUSTRY.					
General expenses, Bureau of Plant Industry, 1910-11.			\$10,000.00	\$8,800.72	\$1,199.28
General expenses, Bureau of Plant Industry, 1911.			1,183,346.00	1,013,756.77	169,589.23
Pathological laboratory	\$21,710	\$21,010.00 D. E. Y		19,669.46	1,340.54
Fruit diseases.	34,075	33,675.00 R		28,936.27	4,738.73
Forest pathology.	16,510	16,310.00 E		14,886.74	1,423.26
Cotton and truck diseases.	12,960	13,360.00 R		11,289.91	2,070.09
Crop physiology.	25,015			23,018.43	1,996.57
Bacteriology and nutrition.	23,725			20,634.21	3,090.79
Crop acclimatization.	34,670			30,859.82	3,810.18
Drug and other plants.	42,970	42,870.00 E. Y		38,995.48	3,874.52
Crop technology.	13,030	14,330.00 N T. Z. A ¹		11,871.80	2,458.20
Cotton standardization.	36,650	34,600.00 W S. T. Z.		24,477.52	10,122.48
		A ¹ . K ¹			
Grain standardization.	51,020	50,520.00 G ¹		39,829.81	10,690.19
Physical investigations	15,255			12,691.96	2,563.04
Special seeds and plants	16,650			14,145.57	2,504.43
Seed-testing laboratories.	25,830			22,741.37	3,088.63
Grain investigations.	61,925	62,675.00 EGI		54,511.32	8,163.68
Tobacco investigations	22,330	21,830.00 F ¹		18,174.49	3,655.51
General plant breeding.	13,700			10,458.34	3,241.66
Paper plant investigations.	8,775	9,575.00 KS		8,507.72	1,067.28
Alkali and drought resistant plants.	17,500			13,045.78	4,454.22
Sugar plant investigations.	23,075			18,212.59	4,862.41
Taxonomic and range investigations.	17,650			15,270.15	2,379.85
Farm management.	130,060	130,510.00 NF ¹ K ¹		114,025.27	16,484.73
Farmers' cooperative demonstration work.	240,155	239,491.00 U		202,657.31	36,833.69
Dry land agriculture.	31,730			26,884.15	4,845.85
Western agricultural extension.	74,380			66,825.30	7,554.70
Pomological investigations.	71,615	71,779.00 U		60,392.87	11,386.13
Experimental gardens and grounds.	13,540	14,894.00 DF		13,752.47	1,141.53
Arlington farm and horticulture.	34,930	36,630.00 QG ¹		31,512.51	5,117.49
South Texas garden.	9,100			8,908.97	191.03
Administrative and miscellaneous.	42,811	41,007.00 FGIQ		36,569.18	4,437.82
Purchase and distribution of valuable seeds.			309,590.00	279,281.61	30,308.39
Congressional seed distribution.	265,710			239,844.97	25,865.03
Foreign seed and plant introduction.	43,880			39,436.64	4,443.36
Investigating the chestnut tree bark disease, 1911-12.			5,000.00	812.31	4,187.69
BUREAU OF CHEMISTRY.					
General expenses, Bureau of Chemistry.			816,340.00	657,766.56	158,573.44
Laboratory, miscellaneous expenses.	36,000			22,969.51	13,030.49
Laboratory, salaries and rent.	73,000			66,467.97	6,532.03
Laboratory, American food products.	5,000			4,523.24	476.76
Food and drugs act, salaries in Washington.	175,000			165,134.56	9,865.44
Food and drugs act, salaries out of Washington (\$287,340).	232,340	247,340.00 A		221,684.85	25,655.15
Food and drugs act, miscellaneous expenses (\$240,000).	220,000	205,000.00 A		126,901.70	78,098.30

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Object.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand.
BUREAU OF CHEMISTRY—continued.					
Allotted to Referee Board: Food and drugs act, salaries out of Washington.	\$55,000	\$53,500.00 H ¹		\$30,153.40	\$23,346.60
Food and drugs act, miscellaneous expenses	20,000	21,500.00 H ¹		19,931.33	1,568.67
BUREAU OF SOILS.					
General expenses, Bureau of Soils.			\$193,600.00	173,113.17	20,486.83
Soil laboratory investigations.	48,000	48,125.00 D ¹		44,477.86	3,647.14
Soil water investigations.	5,000	4,675.00 D ¹		4,136.68	538.32
Soil survey.	135,160			120,458.00	14,702.00
Administrative expenses	5,440	5,040.00 D ¹		4,040.63	1,599.37
General expenses, Bureau of Soils, 1911-12.			2,500.00	1,844.87	655.13
BUREAU OF ENTOMOLOGY.					
General expenses, Bureau of Entomology.			202,900.00	178,079.81	24,820.19
Deciduous fruit insects.	40,600			34,156.47	6,443.53
Cereal and forage insects.	25,000			22,844.53	2,155.47
Southern field crop insects.	47,000			41,191.65	5,808.35
Forest insects.	14,000	15,400.00 B		14,149.23	1,250.77
Truck crop and stored product insects.	16,250	17,875.00 H		15,562.34	2,312.66
Bee culture.	10,000			9,386.41	613.59
Citrus fruit insects.	16,500	14,875.00 H		11,161.05	3,713.95
White fly investigations.	5,000			4,753.10	246.90
Miscellaneous insects.	28,550	27,150.00 B		24,875.03	2,274.97
Preventing spread of moths, Bureau of Entomology.			300,000.00	285,046.84	14,953.16
General expenses, Bureau of Entomology, 1911-12.			10,000.00	4,789.58	5,210.42
BUREAU OF BIOLOGICAL SURVEY.					
General expenses, Bureau of Biological Survey.			71,520.00	59,114.01	12,405.99
Game preservation.	9,420			6,619.37	2,800.63
Maintenance of mammal and bird reservations.	7,000			5,048.09	1,951.91
Food habits of birds and mammals.	25,000			20,944.82	4,055.18
Biological investigations.	18,000	18,100.00 B ¹		16,544.82	1,555.18
Administrative expenses	12,100	12,000.00 B ¹		9,956.91	2,043.09
Protection and removal of elk in Wyoming.			20,000.00	995.38	19,004.62
DIVISION OF PUBLICATIONS.					
General expenses, Division of Publications.			30,000.00	22,131.47	7,868.53
Rent in Washington.	5,000			4,583.33	416.67
Labor-saving machinery, etc.	3,000			2,197.15	802.85
Stationery and materials.	11,500			7,672.42	3,827.58
Furniture and fixtures.	1,000			608.41	391.59
Photographic equipment.	4,000			3,839.46	160.54
Gas, electricity, etc.	1,500			699.48	800.52
Wagons, horses, etc.	1,000			164.69	833.31
Miscellaneous expenses.	3,000			2,364.53	635.47

¹ Congress also appropriated in the sundry civil bill for printing and binding \$460,000.

Appropriations, disbursements, and unexpended balances for the fiscal year 1911—Con.

Objects.	Subappropriations.	Transfer of funds.	Total amount appropriated.	Amount disbursed.	Balance of appropriation on hand
BUREAU OF STATISTICS.					
General expenses, Bureau of Statistics.....			\$115,620.00	\$91,344.10	\$24,275.90
Administrative expenses.....	\$24,920	\$24,119.25 L O		20,110.90	4,008.35
Special field agents.....	56,000	53,600.75 CP		44,579.82	9,020.93
State statistical agents.....	30,200	33,200.00 COP		22,749.47	10,450.53
Special investigations.....	2,000	2,200.00 L		1,622.71	577.29
Cost production farm products.....	2,500			2,281.20	218.80
OFFICE OF EXPERIMENT STATIONS.					
Agricultural experiment stations (\$862,400) ¹			142,400.00	125,816.74	16,583.26
Agricultural experiment stations.....	33,400			30,533.97	2,866.03
Farmers' institutes.....	10,000			8,094.93	1,905.07
Station at Alaska.....	28,000			28,000.00	
Station at Hawaii.....	28,000			28,000.00	
Station at Porto Rico (including \$5,000 for coffee investigations).....	28,000			28,000.00	
Station at island of Guam.....	15,000			13,732.38	1,267.62
Nutrition investigations.....			10,000.00	9,538.07	461.93
Irrigation investigations.....			70,380.00	69,072.68	1,307.32
Drainage investigations.....			78,860.00	69,178.66	9,681.34
OFFICE OF PUBLIC ROADS.					
General expenses, Office of Public Roads.....			92,980.00	81,815.52	11,164.48
Road management.....	16,000			14,437.19	1,562.81
Investigating road building and maintenance.....	43,000			36,803.56	6,196.44
Road material.....	23,280	22,400.00 C ¹ E ¹		21,184.69	1,215.31
Administrative expenses.....	10,700	11,580.00 C ¹ E ¹		9,390.08	2,189.92
Total for main department exclusive of Weather Bureau and Forest Service.....			9,682,476.00	8,129,524.06	1,552,951.94
WEATHER BUREAU.					
Salaries, Weather Bureau.....			\$ 199,427.50	190,870.53	8,556.97
Contingent expenses, Weather Bureau.....			25,000.00	21,131.98	3,868.02
General expenses, Weather Bureau.....			\$1,280,332.50	992,392.84	287,939.66
Station salaries.....	620,410			568,082.53	52,327.47
Miscellaneous expenses.....	94,000	99,000.00 M		79,979.05	19,020.95
Instruments, etc.....	30,000	33,000.00 M		24,912.42	8,087.58
Sand Key building.....	15,000			504.20	14,495.80
Rents and repairs.....	82,500	84,000.00 M		63,676.58	20,323.42
Traveling expenses.....	22,000	20,500.00 X		16,613.52	3,886.48
Telephoning and telegraphing.....	265,700	268,700.00 MX		137,507.80	131,192.20
Line and cable repairs.....	4,000			995.99	3,004.01
Investigations and sub-stations.....	120,000	108,000.00 M		74,466.15	33,533.85
Printing office.....	40,000	27,722.50 M		25,654.60	2,067.90
Total for Weather Bureau.....			1,504,760.00	1,204,395.35	300,364.65
Grand total.....			17,278,976.10	14,759,292.08	2,519,684.02

¹ This includes \$720,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department. Congress also appropriated \$720,000 as a permanent appropriation for State experiment stations under the Adams bill, to be paid through the Treasury Department. Total to be paid through the Treasury Department for State experiment stations, \$1,440,000.

² By the terms of the urgent deficiency act of December 23, 1910 (Public 328), \$20,000 was transferred from the Weather Bureau to the Government Printing Office in connection with the transfer thereto of a portion of the Weather Bureau branch printing office. Of this sum \$6,722.50 was transferred from "Salaries, Weather Bureau," and \$13,277.50 from "General expenses, Weather Bureau (printing office)."

MONTHLY CHECK STATEMENTS.

The check statements submitted by the Treasury and subtreasuries were compared with the checks issued by this division and the amounts verified.

ANNUAL SUPPLIES.

Awards for all ordinary annual supplies for the use of this department during the fiscal year 1911 were made by the General Supply Committee of the Executive Departments, and it was therefore necessary for the Department of Agriculture to advertise independently for only those supplies of a technical character which are used by this department exclusively, and which, for that reason, were designedly omitted from the general schedule. The awards made for these technical supplies were, as heretofore, based upon bids received through advertisement in the columns of the daily newspapers in the large cities and special mail notifications to all of the well-known dealers in the wares required, the bids, when received, being submitted to and passed upon by a board of award acting under the instructions and by the authority of the Secretary. Although supplies aggregating an amount less than \$50 may, under the act of March 1, 1899, be purchased in the open market, all supplies, as far as practicable, were regularly advertised for either directly by the department or through the General Supply Committee.

PUBLIC MONEYS RECEIVED FROM VARIOUS SOURCES.

There were received from various sources and deposited in the Treasury to the credit of the proper funds the following sums:

Miscellaneous receipts, sales of condemned property, etc.....	\$28,611. 67
Sales of products, agricultural station, Hawaii.....	308. 93
Sales of products, agricultural station, Porto Rico.....	2,002. 69
Sales of products, agricultural station, Alaska.....	2,536. 41
Sales of products, agricultural station, Guam.....	12. 15
Total.....	33,471. 85

In this connection it is thought desirable to explain the method pursued in receiving and disposing of the moneys pertaining to the several funds.

The proceeds of "condemned property," "library index cards," and "card index of agricultural literature" prepared by the Office of Experiment Stations are covered into the Treasury to the credit of "Miscellaneous receipts," under section 3618 of the Revised Statutes.

Moneys derived from the sales of products at the insular stations in Hawaii, Porto Rico, Alaska, and Guam are used for the maintenance of those stations.

Up to June 30, 1907, the moneys derived from the sales of "publications" issued by the Weather Bureau were deposited in the Treasury to the credit of the appropriation "General expenses" of that bureau, under section 227 of the Revised Statutes. Since July 1, 1907, these moneys have been deposited to "Miscellaneous receipts," in accordance with the provision in the act making appropriations for this department for the fiscal year ending June 30, 1908. (34 Stat. L., 1258.)

"Seacoast telegraph line receipts" are covered into the Treasury under act of March 3, 1883. (22 Stat. L., 616.)

In acknowledgment of each deposit of funds the Treasurer issues to the depositor a duplicate certificate of deposit. The number of this certificate is entered as part of the transaction, and the certificate is filed in this division.

These moneys are forwarded to the Division of Accounts and Disbursements from the various bureaus, divisions, and offices of the department, accompanied by a letter or specially printed form, in duplicate, explaining whence the money was derived. The duplicate is received by the chief of this division and returned to the sender. The original is placed in the files of this division as a voucher. The amount received is entered in a book with a description of the transaction copied from the letter of transmittal. If in the form of cash or postal money order, it is so stated in the entry, and if by check or draft a minute description is given, with name of payor, payee, indorser, name of bank, number and date of check, etc. The law requires that money so received shall be deposited in the Treasury within 30 days after its receipt by a Government officer. The practice in this office is to deposit all sums as soon as practicable after they are received unless of an insignificant amount. The chief of this division, having no authority to do otherwise, accepts the statements accompanying sums of money submitted to him, assuming them to be in strict accordance with the facts.

ACCOUNTS FOR THE FISCAL YEAR 1909 FINALLY CLOSED.

As required by section 5, legislative act, approved June 20, 1874 (18 Stat. L., 110-111), the unexpended balances of the appropriations for the year 1908 were finally covered into the Treasury on June 30, 1911, and carried to the surplus fund, as follows:

Amount of unexpended balances for fiscal year 1909 turned into the Treasury.

Object.	Amount appropriated.	Amount disbursed.	Amount unexpended.
Salaries, Department of Agriculture, officers and clerks.....	\$879,660	{ \$856,891.19 7,410.85 85,851.79 15,484.39	{ \$22,768.81 189.15 348.21 15.61
Salaries, Department of Agriculture, extra labor.....	7,600		
Contingent expenses, Department of Agriculture.....	86,200.00		
Library, Department of Agriculture.....	15,500.00		
BUREAU OF ANIMAL INDUSTRY.			
General expenses, Bureau of Animal Industry (including \$150,000, deficiency act, Feb. 9, 1909, and \$150,000, deficiency act, Mar. 4, 1909).....	\$1,247,200	{ 1,214,792.71 47,302.19	{ 32,407.29 2,697.81
Animal breeding and feeding.....	50,000		
Meat inspection, Bureau of Animal Industry (permanent appropriation).....	3,000,000.00	2,887,100.05	112,899.95
Eradicating cattle ticks, Bureau of Animal Industry, 1909.....	225,000.00	202,797.16	22,202.84
Eradicating cattle ticks, Bureau of Animal Industry, 1908 and 1909.....	25,000.00	25,000.00	.....
BUREAU OF PLANT INDUSTRY.			
General expenses, Bureau of Plant Industry, 1909.....	886,266.00	873,605.23	12,660.77
Purchase and distribution of valuable seeds.....	\$202,000	{ 201,378.40 55,377.46	{ 621.60 622.54
Foreign seed and plant introduction.....	56,000		
BUREAU OF CHEMISTRY.			
Laboratory, Department of Agriculture (including \$100,000, deficiency act, Feb. 9, 1909).....	860,000.00	826,830.62	33,169.38

Amount of unexpended balances for fiscal year 1909 turned into the Treasury—Continued.

Object.	Amount appropriated.	Amount disbursed.	Amount unexpended.
BUREAU OF SOILS.			
Soil investigations.....	\$200,000.00	\$199,415.09	\$584.91
BUREAU OF ENTOMOLOGY.			
Entomological investigations, 1909.....	148,800.00	146,280.85	2,519.15
Entomological investigations, 1908 and 1909.....	10,000.00	9,857.82	142.18
Preventing spread of moths, Bureau of Entomology, 1908 and 1909.....	250,000.00	234,440.06	15,559.94
BUREAU OF BIOLOGICAL SURVEY.			
Biological investigations.....	54,420.00	53,968.58	451.42
DIVISION OF PUBLICATIONS.			
Publications, Department of Agriculture ¹	40,000.00	39,915.72	84.28
BUREAU OF STATISTICS.			
Collecting agricultural statistics.....	125,000.00	122,402.81	2,597.19
OFFICE OF EXPERIMENT STATIONS.			
Agricultural experiment stations (\$1,371,000 ²).....	\$30,000		
Farmers' institutes.....	10,000		
Station at Alaska.....	26,000		
Station at Hawaii.....	26,000		
Station at Porto Rico.....	26,000		
Station at Island of Guam.....	5,000		
Nutrition investigations.....	7,000.00		
Irrigation investigations.....	150,000.00		
		1,276,436.31	1,563.69
		9,655.91	344.09
		25,998.70	1.30
		25,990.19	9.81
		26,000.00	
		4,971.45	28.55
		6,995.03	4.97
		149,588.32	411.68
OFFICE OF PUBLIC ROADS.			
Public roads inquiries.....	\$73,000		
Rent and repairs.....	2,000		
	75,000.00	71,836.24	1,163.76
		2,000.00	
Total for main department, exclusive of Weather Bureau and Forest Service.....	9,971,646.00	9,705,575.12	266,070.88
WEATHER BUREAU.			
Salaries, Weather Bureau.....	202,510.00	202,141.48	368.52
Fuel, lights, and repairs, Weather Bureau.....	10,000.00	9,860.75	139.25
Contingent expenses, Weather Bureau.....	11,000.00	10,721.27	278.73
Salaries, station employees, Weather Bureau.....	586,750.00	586,265.12	484.88
General expenses, Weather Bureau.....	852,000.00	831,764.20	20,235.80
Total for Weather Bureau.....	1,662,260.00	1,640,752.82	21,507.18
FOREST SERVICE.			
General expenses, Forest Service.....	3,151,900.00	3,134,455.63	17,444.37
Improvement of the national forests.....	600,000.00	598,688.72	1,311.28
Total for Forest Service.....	3,751,900.00	3,733,144.35	18,755.65
Total of all regular appropriations for entire department.	15,385,806.00	15,079,472.29	306,333.71

¹ Congress also appropriated in the sundry civil bill for printing and binding, \$460,000.

² This includes \$720,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department. Congress also appropriated \$528,000 as a permanent appropriation for State experiment stations under the Adams bill, to be paid through the Treasury Department. Total to be paid through the Treasury Department for State experiment stations, \$1,248,000.

The following amounts for the fiscal years 1907 and 1908 were also covered into the "surplus fund," which was included in the "warrant" for the fiscal year 1909, viz:

"Agricultural experiment stations, 1907".....	\$21.96
"Purchase and distribution of valuable seeds, 1908".....	3.20
"Laboratory, Department of Agriculture, 1908".....	41.50
"Administration, etc., of the national forests, 1908".....	33.00

BUILDINGS RENTED IN THE DISTRICT OF COLUMBIA.

The following statement shows the buildings under rent in the District of Columbia on June 30, 1911:

Buildings rented in the District of Columbia.

Location of buildings.	For what purpose used.	Annual rental.
No. 1362 B Street SW.....	Bureau of Animal Industry, offices.....	\$1,800.00
Nos. 1224-1226 B Street SW.....	Bureau of Animal Industry, offices and storage purposes.	720.00
Rooms 914 and 915 Munsey Building....	Bureau of Animal Industry, offices.....	420.00
Rear of 1228 C Street SW.....	Bureau of Animal Industry, stable.....	144.00
Atlantic Building.....	Forest Service, offices.....	24,805.00
No. 913 E Street NW.....	Forest Service, carpenter shop.....	270.00
No. 215 Thirteenth Street SW.....	Division of Publications, document rooms.....	5,000.00
No. 204 Thirteenth Street SW.....	Office of chief clerk, offices and laboratories.....	360.00
No. 203 Thirteenth Street SW.....	do.....	420.00
No. 203 Thirteenth Street SW.....	do.....	420.00
No. 207 Thirteenth Street SW.....	do.....	420.00
No. 207½ Thirteenth Street SW.....	do.....	420.00
No. 209 Thirteenth Street SW.....	do.....	420.00
No. 224 Twelfth Street SW.....	do.....	2,500.00
Nos. 1304-1306 B Street SW.....	Office of chief clerk, offices, laboratories and storage rooms.	2,500.00
Nos. 1308-1310 B Street SW.....	do.....	360.00
Nos. 221-223 Linwood Place SW.....	Bureau of Plant Industry, seed building.....	4,800.00
No. 1358 B Street SW.....	Bureau of Plant Industry, offices.....	750.00
No. 1360 B Street SW.....	do.....	420.00
No. 818 Four-and-a-half Street SW.....	Bureau of Plant Industry, storage purposes.....	1 160.00
No. 212 Thirteenth Street SW.....	Bureau of Chemistry, offices and laboratories.....	660.00
No. 214 Thirteenth Street SW.....	do.....	660.00
Nos. 210-212 Fourteenth Street SW.....	Bureau of Chemistry, shed for machinery.....	240.00
No. 228½ Thirteen-and-a-half Street SW.....	Bureau of Chemistry, storing food samples.....	2 50.00
No. 216 Thirteenth Street SW.....	Bureau of Chemistry, laboratories and offices.....	16,000.00
Nos. 200-202 Fourteenth Street SW.....	Office of Public Roads, offices and laboratories.....	3,500.00
No. 1316 B Street SW.....	Office of the Solicitor, offices.....	1 542.86
No. 215 Twelfth Street SW.....	Office of Experiment Stations, offices.....	720.00
Total.....		70,481.86

¹ For a period of 4 months, at the rate of \$40 per month, \$160.

² For a period of 2 months, at the rate of \$25 per month, \$50.

³ For a period of 7 months, at the rate of \$100 per month, \$700; from Feb. 1 to 20, at the rate of \$100 per month, \$71.43; from Feb. 21 to 28, at the rate of \$180 per month, \$51.43; for a period of 4 months, at the rate of \$180 per month, \$720.

ESTIMATES OF APPROPRIATIONS.

The estimates of appropriations for the year ending June 30, 1912, were prepared in this division, based upon recommendations made by the chiefs of the several bureaus and divisions, and after receiving the approval of the Secretary were forwarded to the Treasury in accordance with statutory requirements.

APPROPRIATIONS AND ESTIMATES FOR 1912.

Estimates for 1912.

Salaries, Department of Agriculture, Office of the Secretary.....	\$276, 650
Officers and clerks.....	\$260, 450
Extra labor.....	16, 200

WEATHER BUREAU.

Salaries, Weather Bureau.....	342, 800
Contingent expenses, Weather Bureau.....	25, 000
General expenses, Weather Bureau.....	1, 283, 310
Station salaries.....	\$539, 580
Miscellaneous expenses.....	114, 000
Instruments, etc.....	35, 000
Rents and repairs.....	97, 500
Traveling expenses.....	22, 000
Telephoning and telegraphing.....	315, 700
Line and cable repairs.....	4, 000
Investigations and substations.....	120, 000
Printing office.....	35, 530

BUREAU OF ANIMAL INDUSTRY.

Salaries.....		\$494, 070
General expenses, Bureau of Animal Industry.....		1, 288, 180
Inspection and quarantine.....	\$592, 700	
Animal quarantine stations at Baltimore and Boston.....	65, 000	
Eradicating cattle ticks.....	267, 880	
Dairy industry.....	155, 000	
Animal husbandry.....	55, 480	
Diseases of animals.....	80, 180	
Experimental farm.....	25, 000	
Administrative expenses.....	46, 940	
Cooperative experiments in animal feeding and breeding.....		50, 000

BUREAU OF PLANT INDUSTRY.

Salaries.....		330, 320
General expenses, Bureau of Plant Industry.....		1, 347, 326
Pathological laboratory.....	\$22, 930	
Fruit diseases.....	42, 075	
Forest pathology.....	24, 670	
Cotton and truck diseases.....	24, 860	
Crop physiology.....	33, 015	
Bacteriology and nutrition.....	26, 145	
Crop acclimatization.....	34, 670	
Drug and other plants.....	49, 430	
Crop technology.....	10, 610	
Cotton standardization.....	32, 350	
Grain standardization.....	57, 080	
Physical investigations.....	16, 375	
Special seeds and plants.....	13, 110	
Seed testing laboratories.....	26, 650	
Grain investigations.....	77, 925	
Tobacco investigations.....	26, 630	
Forage crop investigations.....	20, 000	
Paper plant investigations.....	9, 515	
Alkali and drought resistant plants.....	18, 140	
Sugar plant investigations.....	32, 355	
Taxonomic and range investigations.....	21, 930	
Farm management.....	138, 920	
Farmers' cooperative demonstration work.....	278, 055	
Dry-land agriculture.....	46, 730	
Western agricultural extension.....	73, 060	
Pomological investigations.....	87, 735	
Experimental gardens and grounds.....	13, 860	
Arlington farm and horticulture.....	38, 990	
South Texas garden.....	11, 260	
Administrative and miscellaneous.....	38, 251	
Purchase and distribution of valuable seeds.....		301, 680
Congressional seed distribution.....	249, 160	
Foreign seed and plant introduction.....	52, 520	

FOREST SERVICE.

Salaries.....		2, 318, 680
General expenses, Forest Service.....		3, 189, 420
Use, maintenance, and protection of national forests—		
District 1.....	\$337, 560	
District 2.....	265, 780	
District 3.....	264, 320	
District 4.....	258, 260	
District 5.....	297, 220	
District 6.....	369, 700	
Fighting forest fires.....	135, 000	
Maintenance and supplies.....	198, 080	
Forest products.....	177, 040	
National forest range investigations.....	18, 420	
Silviculture, national forests.....	166, 640	
General administration.....	211, 400	
Improvement of the national forests.....	490, 000	

BUREAU OF CHEMISTRY.

Salaries.....		\$242, 190
General expenses, Bureau of Chemistry.....		111, 480
Laboratory, miscellaneous expenses.....	\$36, 000	
Laboratory, salaries and rent.....	71, 200	
Laboratory, American food products.....	4, 280	
Enforcement of the food and drugs act.....		610, 110

BUREAU OF SOILS.

Salaries.....		52, 020
General expenses, Bureau of Soils.....		228, 700
Soil laboratory investigations.....	\$51, 600	
Soil water investigations.....	5, 000	
Soil survey.....	166, 960	
Administrative expenses.....	5, 140	

BUREAU OF ENTOMOLOGY.

Salaries.....		60, 130
General expenses, Bureau of Entomology.....		238, 110
Deciduous fruit insects.....	\$39, 700	
Cereal and forage insects.....	35, 000	
Southern field crop insects.....	47, 160	
Forest insects.....	44, 750	
Truck crop and stored product insects.....	19, 100	
Bee culture.....	11, 160	
Citrous fruit insects.....	21, 500	
Miscellaneous insects.....	19, 740	
Preventing spread of moths, Bureau of Entomology.....		284, 840

BUREAU OF BIOLOGICAL SURVEY.

Salaries.....		25, 100
General expenses, Bureau of Biological Survey.....		101, 000
Game preservation.....	\$13, 000	
Maintenance of mammal and bird reservations.....	13, 800	
Food habits of birds and mammals.....	35, 000	
Biological investigations.....	25, 000	
Administrative expenses.....	14, 200	

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

Salaries.....	98, 470
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DIVISION OF PUBLICATIONS.

Salaries.....	177, 510
General expenses, Division of Publications.....	30, 000
Rent in Washington.....	\$5, 000
Labor-saving machinery, etc.....	3, 000
Stationery and materials.....	11, 500
Furniture and fixtures.....	1, 000
Photographic equipment.....	5, 000
Gas, electricity, etc.....	500
Wagons, horses, etc.....	1, 000
Miscellaneous expenses.....	3, 000

BUREAU OF STATISTICS.

Salaries.....	109, 670
General expenses, Bureau of Statistics.....	124, 900
Administrative expenses.....	\$24, 200
Special field agents.....	63, 500
State statistical agents.....	32, 200
Special investigations.....	2, 500
Cost production farm products.....	2, 500

LIBRARY.

Salaries.....	23, 000
General expenses.....	15, 500

OFFICE OF EXPERIMENT STATIONS.

Salaries.....	\$56,500
Agricultural Experiment Stations.....	1,622,500
Agricultural Experiment Stations, to be disbursed by the	
Treasury Department.....	\$1,440,000
Agricultural Experiment Stations.....	37,500
Journal of Agricultural Research.....	20,000
Farmers' institutes.....	20,000
Station at Alaska.....	30,000
Station at Hawaii.....	30,000
Station at Porto Rico.....	30,000
Station at island of Guam.....	15,000
Nutrition investigations.....	15,000
Irrigation investigations.....	80,000
Drainage investigations.....	80,000

OFFICE OF PUBLIC ROADS.

Salaries.....	34,060
General expenses, Office of Public Roads.....	131,840
Road management.....	\$21,780
Investigating road building and maintenance.....	60,000
Road material.....	28,360
Field experiments.....	10,000
Administrative expenses.....	11,700

MISCELLANEOUS.

Contingent expenses, Department of Agriculture.....	110,000
Enforcement of the insecticide act.....	87,000
Emergency fire fighting.....	(¹)

Grand total.....	15,997,066
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Meat inspection, Bureau of Animal Industry (permanent appropriation).	3,000,000
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Appropriated for 1912.

Salaries, Forest Service.....	\$2,318,680.00
Improvement of the national forests.....	500,000.00
General expenses, Forest Service, 1911-12.....	70,000.00
General expenses, Forest Service.....	2,714,420.00
Fighting forest fires.....	\$80,000
Maintenance and supplies.....	198,080
Forest products.....	177,040
National forest range investigations.....	18,420
Silviculture, national forests.....	166,640
Management of forests.....	84,528
Market and miscellaneous investigations.....	33,760
Absaroka National Forest.....	11,520
Alamo National Forest.....	8,770
Angeles National Forest.....	19,983
Apache National Forest.....	11,677
Arapaho National Forest.....	11,484
Arkansas National Forest.....	13,783
Ashley National Forest.....	10,184
Battlement National Forest.....	7,584
Beartooth National Forest.....	10,305
Beaverhead National Forest.....	12,700
Bighorn National Forest.....	18,538
Bitterroot National Forest.....	22,847
Blackfoot National Forest.....	18,262
Black Hills National Forest.....	9,420
Boise National Forest.....	9,173
Bonneville National Forest.....	3,395

¹ Not to exceed 75 per cent of amounts received and deposited in the Treasury from the sale of any products or the use of any land or resources of the national forests.

General expenses, Forest Service—Continued.

Bridger National Forest.....	\$4, 899
Cabinet National Forest.....	18, 341
Cache National Forest.....	5, 953
California National Forest.....	12, 091
Caribou National Forest.....	3, 702
Carson National Forest.....	15, 920
Cascade National Forest.....	14, 084
Challis National Forest.....	8, 679
Chelan National Forest.....	10, 407
Chiricahua National Forest.....	5, 459
Chugach National Forest.....	25, 280
Clearwater National Forest.....	14, 843
Cleveland National Forest.....	17, 937
Cochetopa National Forest.....	9, 540
Coconino National Forest.....	14, 942
Coeur d'Alene National Forest.....	16, 155
Colorado National Forest.....	10, 528
Columbia National Forest.....	16, 472
Colville National Forest.....	13, 525
Coronado National Forest.....	15, 517
Crater National Forest.....	20, 355
Crook National Forest.....	8, 756
Custer National Forest.....	6, 386
Dakota National Forest.....	933
Datil National Forest.....	18, 304
Deerlodge National Forest.....	16, 540
Deschutes National Forest.....	8, 258
Dixie National Forest.....	4, 237
Durango National Forest.....	11, 111
Eldorado National Forest.....	10, 208
Fillmore National Forest.....	5, 477
Fishlake National Forest.....	3, 889
Flathead National Forest.....	28, 151
Florida National Forest.....	6, 970
Fremont National Forest.....	12, 592
Gallatin National Forest.....	12, 505
Gila National Forest.....	17, 606
Gunnison National Forest.....	8, 813
Harney National Forest.....	8, 217
Hayden National Forest.....	7, 626
Helena National Forest.....	10, 955
Holy Cross National Forest.....	8, 469
Humboldt National Forest.....	15, 180
Idaho National Forest.....	10, 720
Inyo National Forest.....	9, 503
Jefferson National Forest.....	11, 930
Jemez National Forest.....	15, 409
Kaibab National Forest.....	6, 982
Kaniksu National Forest.....	20, 568
Kansas National Forest.....	2, 263
Kern National Forest.....	16, 059
Klamath National Forest.....	19, 192
Kootenai National Forest.....	25, 977
La Sal National Forest.....	4, 719
Lassen National Forest.....	12, 865
Leadville National Forest.....	14, 608
Lemhi National Forest.....	6, 609
Lewis and Clark National Forest.....	12, 917
Lincoln National Forest.....	6, 982
Lolo National Forest.....	18, 839
Loquillo National Forest.....	2, 408
Madison National Forest.....	14, 121
Malheur National Forest.....	12, 790
Manti National Forest.....	6, 807
Manzano National Forest.....	3, 963
Marquette National Forest.....	2, 167

General expenses, Forest Service—Continued.

Medicine Bow National Forest.....	\$14,307
Michigan National Forest.....	2,829
Minam National Forest.....	6,356
Minnesota National Forest.....	10,720
Minidoka National Forest.....	4,484
Missoula National Forest.....	20,561
Moapa National Forest.....	1,101
Modoc National Forest.....	12,219
Mono National Forest.....	10,924
Monterey National Forest.....	2,534
Montezuma National Forest.....	8,956
Nebo National Forest.....	1,558
Nebraska National Forest.....	2,919
Nevada National Forest.....	7,139
Nezperce National Forest.....	23,036
Ochoco National Forest.....	11,641
Okanogan National Forest.....	16,745
Olympic National Forest.....	15,962
Oregon National Forest.....	19,462
Ozark National Forest.....	11,496
Palisade National Forest.....	9,739
Paulina National Forest.....	13,802
Payette National Forest.....	15,158
Pecos National Forest.....	11,737
Pend d'Oreille National Forest.....	14,446
Pike National Forest.....	17,184
Plumas National Forest.....	17,900
Pocatello National Forest.....	3,327
Powell National Forest.....	4,911
Prescott National Forest.....	6,248
Rainier National Forest.....	13,603
Rio Grande National Forest.....	10,750
Routt National Forest.....	11,225
Salmon National Forest.....	17,449
San Isabel National Forest.....	9,546
San Juan National Forest.....	11,791
Santa Barbara National Forest.....	14,157
Santiam National Forest.....	11,028
Sawtooth National Forest.....	8,487
Selway National Forest.....	20,962
Sequoia National Forest.....	18,719
Sevier National Forest.....	3,046
Shasta National Forest.....	17,816
Shoshone National Forest.....	7,710
Sierra National Forest.....	19,823
Sioux National Forest.....	5,634
Siskiyou National Forest.....	15,015
Sitgreaves National Forest.....	12,881
Siuslaw National Forest.....	10,491
Snoqualmie National Forest.....	20,007
Sopris National Forest.....	10,019
Saint Joe National Forest.....	21,536
Stanislaus National Forest.....	16,718
Sundance National Forest.....	3,599
Superior National Forest.....	10,533
Tahoe National Forest.....	18,647
Targhee National Forest.....	11,424
Teton National Forest.....	9,125
Toiyabe National Forest.....	7,223
Tongass National Forest.....	23,041
Tonto National Forest.....	7,433
Trinity National Forest.....	23,113
Tusayan National Forest.....	11,918
Uinta National Forest.....	6,090
Umatilla National Forest.....	8,517
Umpqua National Forest.....	14,408

General expenses, Forest Service—Continued.

Uncompahgre National Forest	\$10,756	
Wallowa National Forest	12,188	
Wasatch National Forest	2,396	
Washakie National Forest	7,595	
Washington National Forest	14,945	
Weiser National Forest	14,066	
Wenaha National Forest	9,805	
Wenatchee National Forest	11,478	
White River National Forest	11,779	
Whitman National Forest	17,521	
Wichita National Forest	11,978	
Wyoming National Forest	9,438	
Zuni National Forest	5,287	
General administration, 15 per cent		\$436,942.00

SPECIAL APPROPRIATIONS.

Refunds to depositors, excess of deposits, national forests fund	17,718.05	
Cooperative work, forest investigations	13,977.71	
National bison range	1707.57	
Burial expenses, etc., and relief of dependent relatives of fire fighters on national forests, 1911-12		15,000.00
Reimbursement to temporary employees of Forest Service for time lost fighting fires on national forests	5,450.00	
Reimbursement for horses, etc., lost fighting fires on national forests ..	2,742.90	
Fighting and preventing forest fires in emergency	1,000,000.00	
Total for Forest Service	7,075,638.23	

Salaries, Department of Agriculture (including Forest Service, but not including Weather Bureau)	4,149,410.00	
Officers and clerks	\$4,133,210	
Extra labor	16,200	
Contingent expenses, Department of Agriculture	110,000.00	
Library, Department of Agriculture	15,500.00	
Enforcement of the insecticide act	87,000.00	
National Forest Reservation Commission	25,000.00	
Acquisition of lands for protection of watersheds of navigable streams.	2,000,000.00	
Cooperative fire protection of forested watersheds of navigable streams.	200,000.00	

BUREAU OF ANIMAL INDUSTRY.

General expenses, Bureau of Animal Industry	1,192,300.00	
Inspection and quarantine	\$592,700	
Eradicating cattle ticks	250,000	
Dairy industry	150,000	
Animal husbandry	47,480	
Diseases of animals	78,680	
Experimental farm at Beltsville	10,000	
Construction of buildings at Bethesda and Beltsville	16,500	
Administrative expenses	46,940	
Cooperative experiments in animal feeding and breeding	50,000.00	
Meat inspection, Bureau of Animal Industry (permanent appropriation)	3,000,000.00	
General expenses, Bureau of Animal Industry, 1911-12 (appropriated \$65,000), balance available July 1, 1911		64,989.15

BUREAU OF PLANT INDUSTRY.

General expenses, Bureau of Plant Industry, 1911	1,441,536.00	
Pathological laboratory	\$22,930	
Fruit diseases	42,075	
Forest pathology	24,670	
Cotton and truck diseases	24,860	
Crop physiology	33,015	

General expenses, Bureau of Plant Industry, 1911—Continued.

Bacteriology and nutrition.....	\$26, 145	
Crop acclimatization.....	34, 670	
Drug and other plants.....	46, 930	
Crop technology.....	10, 610	
Cotton standardization.....	32, 350	
Grain standardization.....	57, 080	
Physical investigations.....	16, 375	
Special seeds and plants.....	13, 110	
Seed testing laboratories.....	26, 650	
Grain investigations.....	77, 925	
Tobacco investigations.....	26, 630	
Forage crop investigations.....	20, 000	
Paper plant investigations.....	8, 000	
Alkali and drought resistant plants.....	18, 140	
Sugar plant investigations.....	32, 355	
Taxonomic and range investigations.....	21, 930	
Farm management.....	138, 920	
Agricultural reconnaissance work in Alaska.....	4, 000	
Farmers' cooperative demonstration work.....	350, 000	
Dry land agriculture.....	70, 000	
Western agricultural extension.....	73, 060	
Pomological investigations.....	87, 735	
Experimental gardens and grounds.....	13, 860	
Arlington farm and horticulture.....	38, 000	
South Texas garden.....	11, 260	
Administrative and miscellaneous.....	38, 251	
Purchase and distribution of valuable seeds.....		\$289, 680. 00
Congressional seed distribution.....	237, 160	
Foreign seed and plant introduction.....	52, 520	
Investigating the chestnut tree bark disease, 1911-12 (appropriated \$5,000), balance available July 1, 1911.....		4, 187. 69

BUREAU OF CHEMISTRY.

General expenses, Bureau of Chemistry.....		111, 480. 00
Laboratory, miscellaneous expenses.....	\$36, 000	
Laboratory, salaries and rent.....	71, 200	
Laboratory, American food products.....	4, 280	
Enforcement of the food and drugs act.....		535, 110. 00
Allotted to Referee Board:		
Enforcement of the food and drugs act.....		75, 000. 00

BUREAU OF SOILS.

General expenses, Bureau of Soils.....		211, 240. 00
Soil laboratory investigations.....	\$51, 600	
Investigations of fertilizer resources.....	10, 000	
Soil survey.....	145, 000	
Administrative expenses.....	4, 640	
General expenses, Bureau of Soils, 1911-12 (appropriated \$2,500), balance available July 1, 1911.....		655. 13

BUREAU OF ENTOMOLOGY.

General expenses, Bureau of Entomology.....		246, 950. 00
Deciduous fruit insects.....	\$39, 700	
Cereal and forage insects.....	40, 000	
Southern field crop insects.....	47, 160	
Forest insects.....	44, 750	
Truck crop and stored product insects.....	19, 100	
Bee culture.....	15, 000	
Citrus fruit insects.....	21, 500	
Miscellaneous insects.....	19, 740	
Preventing spread of moths, Bureau of Entomology.....		284, 840. 00
General expenses, Bureau of Entomology, 1911-12 (appropriated \$10,000), balance available July 1, 1911.....		5, 210. 42

BUREAU OF BIOLOGICAL SURVEY.

General expenses, Bureau of Biological Survey.....		\$95,700.00
Game preservation.....	\$12,000	
Maintenance of mammal and bird reservations.....	12,000	
Game for national reservations.....	2,500	
Food habits of birds and mammals.....	35,000	
Biological investigations.....	20,000	
Administrative expenses.....	14,200	
Protection and removal of elk in Wyoming (appropriated \$20,000), balance available July 1, 1911.....		19,004.62

DIVISION OF PUBLICATIONS.

General expenses, Division of Publications ¹		30,000.00
Rent in Washington.....	\$5,000	
Labor-saving machinery, etc.....	3,000	
Stationery and materials.....	11,500	
Furniture and fixtures.....	1,000	
Photographic equipment.....	5,000	
Gas, electricity, etc.....	500	
Wagons, horses, etc.....	1,000	
Miscellaneous expenses.....	3,000	

BUREAU OF STATISTICS.

General expenses, Bureau of Statistics.....		122,900.00
Administrative expenses.....	\$24,700	
Special field agents.....	63,500	
State statistical agents.....	32,200	
Special investigations.....	2,500	

OFFICE OF EXPERIMENT STATIONS.

Agricultural experiment stations (\$1,592,500) ²		152,500.00
Agricultural experiment stations.....	\$37,500	
Farmers' institutes.....	10,000	
Station at Alaska.....	30,000	
Station at Hawaii.....	30,000	
Station at Porto Rico.....	30,000	
Station at Island of Guam.....	15,000	
Nutrition investigations.....		15,000.00
Irrigation investigations.....		100,000.00
Drainage investigations.....		100,000.00

OFFICE OF PUBLIC ROADS.

General expenses, Office of Public Roads.....		126,700.00
Road management.....	\$20,000	
Investigating road building and maintenance.....	60,000	
Road material.....	25,000	
Field experiments.....	10,000	
Administrative expenses.....	11,700	

Total for main department, exclusive of Weather Bureau and Forest Service.....		14,861,893.01
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¹ Congress also appropriated in the sundry civil bill for printing and binding, \$470,000.² This includes \$1,440,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department.

WEATHER BUREAU.

Salaries, Weather Bureau.....	\$313, 170. 00
Contingent expenses, Weather Bureau.....	25, 000. 00
General expenses, Weather Bureau.....	1, 262, 080. 00
Station salaries.....	\$546, 580
Miscellaneous expenses.....	104, 000
Instruments, etc.....	35, 000
Key West building.....	15, 000
Rents and repairs.....	97, 500
Traveling expenses.....	22, 000
Telephoning and telegraphing.....	300, 000
Line and cable repairs.....	4, 000
Investigations and substations.....	120, 000
Printing office.....	18, 000
Total for Weather Bureau.....	1, 600, 250. 00
Grand total.....	23, 537, 781. 24

FISCAL AFFAIRS OF THE FOREST SERVICE.

The following statement, furnished by the fiscal agents of the Forest Service, is printed:

Statement of the fiscal transactions of the Forest Service.

	District 1, Missoula.	District 2, Denver.	District 3, Albuquerque	District 4, Ogden.	District 5, San Francisco.	District 6, Portland.	Washington and Madison	Total
Requisitions issued for the purchase of supplies.....				1,214			2,390	3,604
Letters of authorization issued for travel.....	65	172	132	83	58	80	166	756
Accounts paid during the fiscal year 1911, including those paid from the cooperative fund.....	10,649	9,269	7,743	8,344	7,643	9,157	3,692	56,497
Accounts paid from the appropriations for the fiscal year 1911, including the cooperative fund ¹	\$1,477,607.54	\$661,651.55	\$391,501.99	\$748,901.75	\$681,741.62	\$821,681.87	\$472,992.45	\$5,459,078.77
Supplemental accounts paid from the appropriations for the fiscal year 1910, from July 1, 1910, to June 30, 1911, under waiver from the Treasury Department ²	\$72,532.18	\$61,062.15	\$57,295.63	\$61,583.87	\$56,637.91	\$68,596.53	\$557,464.23	\$935,172.50
Checks drawn during the fiscal year above mentioned in payment of accounts for 1911, and supplemental accounts for 1910.....	20,848	18,875	13,407	15,036	15,964	20,138	4,919	109,217
Passenger transportation requests issued.....	1,780	2,000	900	1,164	789	1,383	1,762	9,808
Requests on Quartermaster's Department for freight transportation, and also on this office for departmental bill of lading for freight transportation.....	1,071	759	566	1,592	669	389	310	5,356
Money received from—								
Sale of condemned Government property.....		\$412.84	\$49.85	\$72.17	\$1,070.44	\$133.50		\$1,738.80
Lost Government property.....	\$211.26	\$212.00	\$188.76	\$158.61	\$131.62	\$279.29	\$306.44	\$1,547.98
Accounts forwarded to the Treasury Department for direct settlement:								
Fiscal year 1909.....								61
Fiscal year 1910.....								484
Fiscal year 1911.....								854
Checks lost in transit through the mails or by the payee.....	28	24	34	23	44	28	2	183
Letters written in the ordinary transaction of business.....	5,200	6,000	3,603	3,000	4,231	4,250	5,150	31,431
Letters received in the ordinary course of business.....	4,420	4,000	3,000	3,000	5,100	3,900	8,250	31,670
Money received from timber sales, etc.....	\$418,123.11	\$402,128.71	\$372,908.08	\$365,380.20	\$224,531.06	\$271,630.74		\$2,054,701.59
Money received from cooperative work.....	\$145.06	\$860.00			\$360.70		\$5,694.62	\$7,020.38
Requisitions drawn on the Treasury Department for advances of public funds, including temporary special disbursing agents and district fiscal agents.....								
Temporary special disbursing agents and district fiscal agents active during the fiscal year 1911.....	28	11	17	13	17	34	16	136
Amount of requisitions issued to the temporary special disbursing agents and district fiscal agents during the fiscal year 1911.....	4	2	2	1	3	4	2	18
	\$1,607,186.61	\$780,500.00	\$620,900.00	\$866,108.15	\$800,977.40	\$1,071,456.20	\$298,755.67	\$6,025,884.03

¹ Includes \$31,955.55 statutory salary of law officers and district fiscal agents not reported on regular Forest Service statements, and \$1,871 expended on cooperative work with other Federal bureaus which has been returned to the appropriation by transfer settlement through the Treasury Department.

² Includes \$1,568.88 Federal cooperative expenditures—regular appropriation reimbursed; also \$306,194.83 paid to States—25 per cent of receipts from national forest resources.

ANNUAL REPORT OF EXPENDITURES.

A classified statement of the expenditures of the department for the fiscal year ended June 30, 1911 (extended to August 31, 1911), was prepared in accordance with law and will be submitted to the Committee on Expenditures. A recapitulation of the expenditures of the department will be found below, classified as required by the committee:

Recapitulation of the several appropriations for the entire Department of Agriculture as distributed among the following groups, and the total expenditures under each.

Statutory salaries.....	\$1,442,269.12
Lump-fund salaries in Washington.....	1,517,726.02
Lump-fund salaries outside of Washington.....	8,324,499.82
Stationery.....	128,302.78
Miscellaneous supplies and services, equipment, books, machinery, etc.	2,674,990.08
Furniture.....	55,052.28
Fuel.....	30,889.44
Freight.....	41,795.15
Express.....	18,292.46
Telegraph.....	132,060.53
Telephone.....	47,172.24
Rent.....	279,171.57
Gas and electricity.....	22,280.82
Apparatus, instruments, and laboratory material.....	126,017.61
Travel and station and field expenses.....	1,165,481.30
Total.....	16,006,001.22
Total appropriations for Department of Agriculture.....	19,421,876.43
Total expenditures under above groups.....	\$16,006,001.22
Advances to temporary special disbursing agents of the	
Forest Service.....	31,240.50
Forest Service refunds:	
To depositors, excess deposits.....	57,912.73
Payments to States and Territories, 25 per cent of	
receipts.....	506,194.83
Total expenditures of entire Department of Agriculture.....	16,601,349.28
Unexpended balance on Aug. 31, 1911.....	2,820,527.15
Repayments to credit of appropriations.....	21,129.48
Net unexpended balance on Aug. 31, 1911.....	2,841,656.63
Of this amount there was available for further disbursement.....	95,940.19
Balance.....	2,745,716.44
Outstanding liabilities (estimated).....	605,221.47
Balance to be turned back in Treasury (estimated).....	2,140,494.97

CENTRALIZATION OF FISCAL WORK.

The appropriation act of the department for the fiscal year 1911, which went into effect July 1, 1910, transferred the fiscal agents of the Forest Service to the Division of Accounts and Disbursements, thus centralizing, in this division, the fiscal affairs of the entire department.

THE WEEKS LAW.

Under the act entitled "An act to enable any State to cooperate with any other State or States, or with the United States, for the

protection of watersheds of navigable streams, and to appoint a commission for the acquisition of lands for the purpose of conserving the navigability of navigable streams," approved March 1, 1911, the Department of Agriculture is to receive \$2,000,000 per annum for the acquisition of lands for the protection of watersheds of navigable streams and \$25,000 per annum for the National Forest Reservation Commission, up to 1915, and \$200,000 for cooperative fire protection of forested watersheds of navigable streams, to be available until used. The liabilities incurred against these funds will be audited and paid by the Division of Accounts and Disbursements, and proper record thereof made for the purpose of reporting to Congress the expenditures authorized under the law.

CONDITION OF WORK IN THE DIVISION.

The work of the division is as nearly up to date as it is practicable to bring up work of this character. There is a growing need, however, for additional funds for the temporary employment of stenographers and typewriters to assist in the preparation of the several fiscal reports annually required by Congress.

FINANCES OF THE DEPARTMENT FOR 72 YEARS.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture from the fiscal year 1839 to the fiscal year 1911, inclusive.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Collection of agricultural statistics, etc.	Mar. 3, 1839	5	354	9	1839	\$1,000.00	\$1,000.00
	Aug. 26, 1842	5	533	26	1842	1,000.00	1,000.00	.....
	Mar. 3, 1843	5	642	1	1844	2,000.00	2,000.00	.....
	June 17, 1844	5	687	1	1845	2,000.00	2,000.00	.....
	Mar. 3, 1845	5	757	1	1846	3,000.00	3,000.00	.....
	Mar. 3, 1847	9	160	1	1847	3,000.00	3,000.00	.....
	Aug. 12, 1848	9	285	1	1848	3,500.00	3,500.00	.....
Chemical analyses of vegetable substances.	.....do.....	9	285	1	1848	1,000.00	1,000.00	.....
Collection of agricultural statistics, etc.	Mar. 3, 1849	9	364	1	1849	3,500.00	3,500.00	.....
Chemical analyses of vegetable substances.	.....do.....	9	364	1	1850	1,000.00	1,000.00	.....
Collection of agricultural statistics.	Sept. 30, 1850	9	541	1	1850	4,500.00	4,500.00	.....
	Mar. 3, 1851	9	615	1	1851	5,500.00	5,500.00	.....
Collection of agricultural statistics and purchase of seeds.	Aug. 31, 1852	10	95	1	1852	5,000.00	5,000.00	.....
Collection of agricultural statistics and purchase, etc., of seeds.	Mar. 3, 1853	10	208	1	1853	5,000.00	5,000.00	.....
	May 31, 1854	10	292	1	1854	10,000.00	10,000.00	.....
	Aug. 4, 1854	10	567	1	1855	50,000.00	50,000.00	.....
	Mar. 3, 1855	10	664	1				
Collection of agricultural statistics, etc., and purchase, etc., of seeds.	May 15, 1856	11	14	1	1856	30,000.00	30,000.00	.....
	Aug. 18, 1856	11	89	1	1857	75,000.00	75,000.00	.....
	Mar. 3, 1857	11	226	1	1858	60,000.00	60,000.00	.....
Information in relation to consumption of cotton.	.....do.....	11	226	1	1858	3,500.00	3,157.25	\$342.75
	June 12, 1858	11	321	1	1859	60,000.00	60,000.00	.....
Collection of agricultural statistics, etc., and purchase, etc., of seeds.	Mar. 3, 1859	11	427	1	1860	40,000.00	40,000.00	.....
	June 25, 1860	12	108	1	1861	60,000.00	60,000.00	.....
	Mar. 2, 1861	12	217	1	1862	64,000.00	63,704.21	295.79
	Feb. 13, 1862	12	338	---				
Collection of agricultural statistics, etc., and purchase, etc., of seeds, including a deficiency appropriation of \$20,000, made Mar. 3, 1863.	Mar. 1, 1862	12	350	1	1863	80,000.00	80,000.00	.....

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Salaries.....	Feb. 25, 1863	12	691	1	1864	\$5,000.00	\$5,000.00	.....
Collection of agricultural statistics, etc., and purchase, etc., of seeds.....	.....do.....	12	691	1	1864	87,000.00	87,000.00	.....
Culture of cotton and tobacco.....	.....do.....	12	691	1	1864	3,000.00	3,000.00	.....
Investigations with flax and hemp.....	.....do.....	12	691	1	1864	20,000.00	9,500.00	\$10,500.00
Purchase of sorghum seed.....	Mar 14, 1864	13	23	1	1864	2,000.00	2,000.00	.....
To rebuild shop in propagating garden.....	.....do.....	13	23	1	1864	800.00	800.00	.....
Postage.....	.....do.....	13	23	1	1864	1,320.00	1,320.00	.....
Furniture, carpets, fuel, etc.....	.....do.....	13	23	1	1864	650.00	650.00	.....
Salaries.....	June 25, 1864	13	155	1	1865	38,300.00	38,300.00	.....
Contingent expenses.....	July 2, 1864	13	350	2	1865	3,500.00	3,500.00	.....
Collecting agricultural statistics.....	June 25, 1864	13	155	1	1865	20,000.00	20,000.00	.....
Furniture, carpets, etc.....	.....do.....	13	155	1	1865	800.00	800.00	.....
Library and laboratory.....	.....do.....	13	155	1	1865	4,000.00	4,000.00	.....
Purchase and distribution of seeds.....	.....do.....	13	155	1	1865	61,000.00	61,000.00	.....
Experimental garden and grounds.....	.....do.....	13	155	1	1865	15,800.00	15,800.00	.....
To pay a debt incurred in preparing the Agricultural Report for 1861.....	July 2, 1864	13	350	2	1865	3,704.05	3,596.55	107.50
Rent, etc., of commissioner's office.....	July 4, 1864	13	381	3	1865	3,500.00	3,500.00	.....
Salaries.....	Mar. 2, 1865	13	160	3	1866	46,726.59	46,726.59	.....
Contingent expenses.....	.....do.....	13	455	1	1866	7,500.00	7,500.00	.....
Collecting agricultural statistics.....	.....do.....	13	455	1	1866	20,000.00	20,000.00	.....
Purchase, etc., of seeds.....	.....do.....	13	160	3	1866	70,165.90	70,165.90	.....
Experimental garden and grounds, etc.....	.....do.....	13	455	1	1866	23,395.33	23,395.33	.....
Salaries.....	July 23, 1866	14	201	1	1867	39,600.00	39,600.00	.....
Contingent expenses.....	.....do.....	14	201	1	1867	11,500.00	11,500.00	.....
Collecting agricultural statistics.....	.....do.....	14	201	1	1867	10,000.00	10,000.00	.....
Purchase of seeds.....	.....do.....	14	201	1	1867	115,200.00	115,200.00	.....
Experimental garden and grounds, etc.....	Mar. 30, 1867	15	28	1	1867	22,800.00	22,800.00	.....
Salaries.....	July 23, 1866	14	202	1	1867	38,020.00	38,020.00	.....
Contingent expenses.....	Mar. 2, 1867	14	451	1	1868	13,000.00	13,000.00	.....
Collecting agricultural statistics.....	.....do.....	14	451	1	1868	10,000.00	8,406.34	1,593.66
Purchase, etc., of seeds.....	.....do.....	14	452	1	1868	85,200.00	85,200.00	.....
Museum.....	.....do.....	14	452	1	1868	10,000.00	10,000.00	.....
Experimental garden and grounds.....	.....do.....	14	452	1	1868	22,800.00	22,800.00	.....
To erect a building for the Department of Agriculture.....	.....do.....	14	464	1	1868	100,000.00	99,668.00	332.00
For certain goods and services furnished the department.....	July 13, 1868	15	90	1	1869	37,604.70	37,604.70	.....
Salaries.....	July 20, 1868	15	105	1	1869	65,368.00	65,368.00	.....
Collecting agricultural statistics.....	.....do.....	15	106	1	1869	10,000.00	10,000.00	.....
Contingent expenses.....	.....do.....	15	196	1	1869	31,090.00	31,090.00	.....
Experimental garden and grounds.....	.....do.....	15	106	1	1869	23,500.00	23,500.00	.....
Purchase, etc., of seeds.....	.....do.....	15	106	1	1869	20,000.00	20,000.00	.....
Furniture, cases, and repairs.....	.....do.....	15	106	1	1869	22,635.00	22,635.00	.....
Salaries.....	Mar. 3, 1869	15	297	1	1870	69,240.00	67,720.00	1,520.00
Collecting agricultural statistics.....	.....do.....	15	298	1	1870	15,000.00	15,000.00	.....
Investigations of cattle disease.....	.....do.....	15	298	1	1870	15,000.00	12,695.60	2,304.40
Contingent expenses.....	.....do.....	15	298	1	1870	13,200.00	13,200.00	.....
Furniture, cases, and repairs.....	.....do.....	15	298	1	1870	2,500.00	2,500.00	.....

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Experimental garden and grounds.....	Mar. 8, 1869	15	298	1	1870	\$21,500.00	\$21,500.00
Purchase, etc., of seeds.....do.....	15	298	1	1870	20,000.00	18,981.33	\$1,018.67
Salaries.....	July 12, 1870	16	245	1	1871	71,980.00	71,811.64	168.36
.....	July 15, 1870	16	314	1	1871			
Collecting agricultural statistics.....	July 12, 1870	16	245	1	1871	15,000.00	15,000.00	.....
Purchase, etc., of seeds.....	.....do.....	16	246	1	1871	30,000.00	28,865.17	1,134.83
.....	.....do.....	16	246	1	1871			
Experimental garden and grounds.....	July 15, 1870	16	302	1	1871	53,200.00	53,200.00	.....
.....	.....do.....	16	303	1	1871			
Contingent expenses.....	July 12, 1870	16	246	1	1871	8,100.00	8,100.00	.....
Furniture, cases, and repairs.....	.....do.....	16	246	1	1871	4,700.00	4,700.00	.....
Collecting and modeling specimens of fruit.....	.....do.....	16	246	1	1871	1,000.00	1,000.00	.....
Library.....	.....do.....	16	246	1	1871	1,000.00	1,000.00	.....
Herbarium.....	.....do.....	16	246	1	1871	1,000.00	1,000.00	.....
Laboratory.....	.....do.....	16	246	1	1871	1,700.00	1,700.00	.....
Folding room.....	.....do.....	16	246	1	1871	500.00	500.00	.....
Salaries.....	Mar. 3, 1871	16	489	1	1872	75,170.00	75,017.89	152.11
Collecting agricultural statistics.....	.....do.....	16	489	1	1872	15,000.00	14,059.36	940.64
Purchase and distribution of seeds, etc.....	.....do.....	16	489	1	1872	45,000.00	45,000.00	.....
Experimental garden and grounds.....	.....do.....	16	489	1	1872	36,800.00	36,800.00	.....
.....	.....do.....	16	509	1	1872			
Contingent expenses.....	.....do.....	16	489	1	1872	12,900.00	12,900.00	.....
.....	.....do.....	16	490	1	1872			
Furniture, cases, and repairs.....	.....do.....	16	490	1	1872	4,700.00	4,700.00	.....
Collecting and modeling specimens of fruit.....	.....do.....	16	490	1	1872	1,000.00	1,000.00	.....
Herbarium.....	.....do.....	16	490	1	1872	1,000.00	1,000.00	.....
Library.....	.....do.....	16	490	1	1872	2,650.00	2,050.00	.....
Laboratory.....	.....do.....	16	490	1	1872	3,450.00	3,450.00	.....
Salaries.....	May 8, 1872	17	77	1	1873	75,890.00	75,889.73	.27
Collecting agricultural statistics.....	.....do.....	17	77	1	1873	15,000.00	15,000.00	.....
Purchase and distribution of seeds.....	.....do.....	17	77	1	1873	55,000.00	55,000.00	.....
Experimental garden and grounds.....	.....do.....	17	77	1	1873	31,000.00	31,000.00	.....
.....	June 10, 1872	17	368	1	1873			
Contingent expenses.....	.....do.....	17	77	1	1873	13,300.00	12,507.06	792.94
.....	May 8, 1872	17	78	1	1873			
Folding room.....	.....do.....	17	77	1	1873	300.00	300.00	.....
Furniture, cases, and repairs.....	.....do.....	17	78	1	1873	5,200.00	5,200.00	.....
Museum and herbarium.....	.....do.....	17	78	1	1873	5,000.00	4,674.43	325.57
.....	June 10, 1872	17	369	1	1873			
Library.....	May 8, 1872	17	78	1	1873	1,750.00	1,750.00	.....
Salaries.....	Mar. 3, 1873	17	506	1	1874	78,190.00	76,924.00	1,266.00
Collecting agricultural statistics.....	.....do.....	17	506	1	1874	15,000.00	11,553.20	3,446.80
.....	.....do.....	17	506	1	1874			
Purchase and distribution of seeds, etc.....	.....do.....	17	507	1	1874	65,000.00	64,904.89	95.11
.....	.....do.....	17	540	1	1874			
Experimental garden and grounds.....	.....do.....	17	507	1	1874	26,200.00	25,731.74	468.26
.....	.....do.....	17	529	1	1874			
Museum and herbarium.....	.....do.....	17	507	1	1874	2,000.00	1,942.02	57.98
Contingent expenses.....	.....do.....	17	507	1	1874	13,600.00	12,699.34	900.66
Furniture, cases, and repairs.....	.....do.....	17	507	1	1874	4,200.00	3,302.40	897.60
Library.....	.....do.....	17	507	1	1874	1,500.00	1,259.10	240.90
Postage.....	.....do.....	17	542	4	1874	52,000.00	35,449.09	16,550.91
Salaries.....	June 20, 1874	18	107	1	1875	77,180.00	77,127.60	52.40
Collecting agricultural statistics.....	.....do.....	18	107	1	1875	15,000.00	12,147.56	2,852.44
Purchase and distribution of seeds, etc.....	.....do.....	18	107	1	1875	95,000.00	94,719.83	280.17
.....	Jan. 25, 1875	18	303	3	1875			
Furniture, cases, and repairs.....	June 20, 1874	18	107	1	1875	4,200.00	4,135.36	64.64
Experimental garden and grounds.....	.....do.....	18	107	1	1875	24,100.00	24,094.06	5.94
.....	June 23, 1874	18	227	1	1875			
Contingent expenses.....	June 20, 1874	18	107	1	1875	12,600.00	10,972.61	1,627.39
.....	.....do.....	18	107	1	1875			
Museum and herbarium.....	June 23, 1874	18	227	1	1875	4,500.00	3,300.00	1,020.00
Laboratory.....	.....do.....	18	227	1	1875	1,300.00	1,300.00	.....
Library.....	.....do.....	18	227	1	1875	1,500.00	1,087.90	412.10

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Postage.....	June 20, 1874	18	107	1	1875	\$52,000.00	\$42,633.00	\$9,367.00
To publish commissioner's report for the years 1872 and 1873.....	June 23, 1874	18	227	1	1875	50,000.00	49,561.91	438.09
Salaries.....	Mar. 3, 1875	18	368	1	1876	77,180.00	77,115.71	64.29
Collecting agricultural statistics.	do.....	18	368	1	1876	15,000.00	14,500.00	500.00
Purchase and distribution of seeds.....	do.....	18	368	1	1876	65,000.00	65,000.00	.....
Experimental garden and grounds.....	do.....	18	394	1	1876	19,990.00	19,956.11	33.89
Museum and herbarium.....	do.....	18	368	1	1876	2,000.00	1,993.55	6.45
Furniture, cases, and repairs.....	do.....	18	368	1	1876	3,300.00	3,124.23	175.77
Library.....	do.....	18	368	1	1876	1,250.00	1,046.84	203.16
Laboratory.....	do.....	18	368	1	1876	1,300.00	1,300.00	.....
Contingent expenses.....	do.....	18	368	1	1876	12,100.00	11,378.91	721.09
Postage.....	do.....	18	368	1	1876	52,000.00	3,428.29	48,571.71
Salaries.....	July 21, 1876	19	95	1	1877	67,836.96	67,806.19	30.77
Experimental garden and grounds.....	Aug. 15, 1876	19	167	1				
Collecting agricultural statistics.	July 31, 1876	19	115	1	1877	11,550.00	11,550.00	.....
Purchase and distribution of seeds, etc.....	Aug. 15, 1876	19	167	1				
Museum and herbarium.....	do.....	19	167	1	1877	10,000.00	10,000.00	.....
Furniture, cases, and repairs.....	Mar. 3, 1877	19	319	1	1877	85,000.00	80,000.00	5,000.00
Library.....	do.....	19	167	1	1877	2,000.00	2,000.00	.....
Laboratory.....	do.....	19	167	1	1877	2,000.00	2,000.00	.....
Contingent expenses.....	do.....	19	167	1	1877	1,000.00	800.00	200.00
Postage.....	do.....	19	167	1	1877	1,300.00	1,300.00	.....
Salaries.....	do.....	19	167	1	1877	10,000.00	8,800.00	1,200.00
Collecting agricultural statistics.	do.....	19	167	1	1877	4,000.00	3,450.00	50.00
Purchase and distribution of seeds, etc.....	Mar. 3, 1877	19	317	1	1878	65,640.00	65,640.00	.....
Experimental garden and grounds.....	do.....	19	317	1	1878	15,000.00	15,000.00	.....
Museum.....	do.....	19	317	1	1878	75,000.00	74,579.33	420.67
Furniture, cases, and repairs.....	do.....	19	317	1	1878	10,500.00	10,500.00	.....
Library.....	do.....	19	317	1	1878	1,500.00	1,500.00	.....
Laboratory.....	do.....	19	317	1	1878	4,500.00	4,500.00	.....
Contingent expenses.....	do.....	19	317	1	1878	1,000.00	1,000.00	.....
Postage.....	do.....	19	317	1	1878	1,000.00	1,000.00	.....
Report on forestry.....	do.....	19	317	1	1878	8,000.00	8,000.00	.....
International Industrial Exposition at Paris.....	do.....	19	317	1	1878	4,000.00	3,415.61	584.39
Salaries.....	do.....	19	360	1	1878	2,500.00	2,500.00	.....
Collecting agricultural statistics.	Dec. 15, 1877	20	246	4	1878	10,000.00	10,000.00	.....
Purchase and distribution of seeds, etc.....	June 19, 1878	20	203	1	1879	66,900.00	66,900.00	.....
Experimental garden and grounds.....	do.....	20	203	1	1879	10,000.00	10,000.00	.....
Museum.....	do.....	20	203	1	1879	75,000.00	75,000.00	.....
Furniture, cases, and repairs.....	do.....	20	203	1	1879	13,500.00	13,500.00	.....
Library.....	do.....	20	240	1	1879	1,000.00	1,000.00	.....
Laboratory.....	do.....	20	204	1	1879	4,000.00	4,000.00	.....
Contingent expenses.....	do.....	20	204	1	1879	1,000.00	1,000.00	.....
Postage.....	do.....	20	204	1	1879	1,500.00	1,500.00	.....
Investigating the history and habits of insects.....	do.....	20	204	1	1879	8,000.00	8,000.00	.....
Investigating diseases of domestic animals.....	do.....	20	204	1	1879	4,000.00	3,900.00	40.00
To erect a stable.....	do.....	20	204	1	1879	10,000.00	10,000.00	.....
Salaries.....	Mar. 3, 1879	20	392	1	1879	10,000.00	10,000.00	.....
Collecting agricultural statistics.	June 21, 1879	21	23	1	1880	1,500.00	1,500.00	.....
Purchase and distribution of seeds, etc.....	do.....	21	23	1	1880	66,900.00	66,900.00	.....
Experimental garden and grounds.....	do.....	21	23	1	1880	10,000.00	9,982.88	17.12
Museum.....	do.....	21	23	1	1880	75,000.00	75,000.00	.....
Furniture, cases, and repairs.....	do.....	21	23	1	1880	13,100.00	13,100.00	.....
Library.....	do.....	21	23	1	1880	1,000.00	1,000.00	.....
Laboratory.....	do.....	21	23	1	1880	4,000.00	4,000.00	.....
Contingent expenses.....	do.....	21	23	1	1880	1,000.00	1,000.00	.....
Postage.....	do.....	21	23	1	1880	1,500.00	1,500.00	.....
Investigating the history and habits of insects.....	do.....	21	23	1	1880	8,000.00	8,000.00	.....

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Postage.....	June 21, 1879	21	23	1	1880	\$4,000.00	\$4,000.00
Investigating the history and habits of insects.....do.....	21	29	1	1880	5,000.00	5,000.00
Investigating diseases of domestic animals.....	.....do.....	21	30	1	1880	10,000.00	8,878.84	\$1,121.16
Salaries.....	June 16, 1880	21	292	1	1881	69,200.00	69,185.22	14.78
Purchase and distribution of seeds, etc.....	.....do.....	21	294	1	1881	102,160.31	102,157.48	2.83
Collecting agricultural statistics.....	May 3, 1881	21	453	1	1881	10,000.00	9,985.60	14.40
Experimental garden and grounds.....	June 16, 1880	21	293	1	1881	12,600.00	12,600.00	.....
Museum.....	.....do.....	21	294	1	1881	1,000.00	1,000.00	.....
Furniture, cases, and repairs.....	.....do.....	21	294	1	1881	5,000.00	5,000.00	.....
Library.....	.....do.....	21	294	1	1881	1,000.00	1,000.00	.....
Laboratory.....	.....do.....	21	295	1	1881	4,000.00	4,000.00	.....
Contingent expenses.....	.....do.....	21	295	1	1881	10,000.00	9,769.17	230.83
Postage.....	.....do.....	21	295	1	1881	4,000.00	3,838.00	162.00
Report on forestry.....	.....do.....	21	296	1	1881	5,000.00	3,762.51	1,237.49
Investigating the history and habits of insects.....	.....do.....	21	294	1	1881	5,000.00	4,997.31	2.69
Investigating the diseases of domestic animals.....	.....do.....	21	295	1	1881	10,000.00	10,000.00	.....
Examination of fibers.....	.....do.....	21	295	1	1881	4,000.00	4,000.00	.....
Experiments in the manufacture of sugar.....	.....do.....	21	295	1	1881	7,500.00	7,500.00	.....
Collecting data touching arid regions of the United States.....	.....do.....	21	295	1	1881	5,000.00	460.00	4,540.00
Reclamation of arid lands.....	.....do.....	21	295	1	1881	20,000.00	18,353.55	(¹)
Salaries.....	Mar. 3, 1881	21	381	1	1882	79,500.00	79,491.81	8.19
Collecting agricultural statistics.....	.....do.....	21	382	1	1882	10,000.00	10,000.00	.....
Laboratory.....	.....do.....	21	382	1	1882	6,000.00	5,811.85	188.15
Purchase and distribution of seeds, etc.....	.....do.....	21	382	1	1882	100,000.00	99,991.53	8.47
Experiments in the culture, etc., of tea.....	Apr. 16, 1882	22	44	1	1882	10,000.00	8,750.87	1,249.13
Experimental garden and grounds.....	Mar. 3, 1881	21	383	1	1882	15,000.00	14,968.25	31.75
Museum.....	.....do.....	21	385	1	1882	1,000.00	1,000.00	.....
Furniture, cases, and repairs.....	.....do.....	21	383	1	1882	4,000.00	4,000.00	.....
Library.....	.....do.....	21	383	1	1882	1,000.00	973.85	26.15
Investigating the history and habits of insects.....	.....do.....	21	383	1	1882	20,000.00	19,998.94	1.06
Examination of fibers.....	.....do.....	21	384	1	1882	5,000.00	5,000.00	.....
Investigating the diseases of domestic animals.....	.....do.....	21	384	1	1882	25,000.00	22,443.89	2,556.11
Collecting data touching the arid regions of the United States.....	.....do.....	21	384	1	1882	5,000.00	4,216.55	783.45
Reclamation of arid lands, including an unexpended balance of \$1,646.45 from fiscal year 1881.....	.....do.....	21	384	1	1882	11,646.45	11,561.19	(²)
Report on forestry.....	.....do.....	21	384	1	1882	5,000.00	4,941.00	59.00
Postage.....	.....do.....	21	384	1	1882	4,000.00	4,000.00	.....
Contingent expenses.....	.....do.....	21	384	1	1882	10,000.00	10,000.00	.....
Building for display of agricultural implements.....	.....do.....	21	385	1	1882	10,000.00	10,000.00	.....
Experiments in the manufacture of sugar (including \$864.60 from sale of molasses, etc.).....	.....do.....	21	384	1	1882	35,864.60	32,333.75	(³)
Transportation of specimens from Atlanta.....	Feb. 13, 1882	22	3	1	1882	5,000.00	4,998.91	1.09
Salaries.....	May 19, 1882	22	89	1	1883	102,580.00	102,575.49	4.51
Collecting agricultural statistics.....	.....do.....	22	90	1	1883	80,000.00	78,170.80	1,829.20
Laboratory.....	.....do.....	22	90	1	1883	6,000.00	6,000.00	.....
Purchase and distribution of seeds, etc.....	.....do.....	22	90	1	1883	80,000.00	80,000.00	.....

¹ Unexpended balance of \$1,646.45 carried to fiscal year 1882.² Unexpended balance of \$85.26 carried to fiscal year 1883.³ Unexpended balance of \$3,530.85 carried to fiscal year 1883.

*Statement of appropriations, disbursements, and unexpended balances for the United States
Department of Agriculture, etc.—Continued.*

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Experiments in the culture, etc., of tea.....	May 19, 1882	22	91	1	1883	\$5,000.00	\$3,905.66	\$1,094.34
Experimental garden and grounds.....	.....do.....	22	91	1	1883	15,500.00	15,471.82	28.18
Museum.....	.....do.....	22	91	1	1883	1,000.00	1,000.00	.....
Furniture, cases, and repairs.....	.....do.....	22	91	1	1883	6,700.00	6,700.00	.....
Library.....	.....do.....	22	91	1	1883	1,500.00	1,485.32	14.68
Investigating the history and habits of insects.....	.....do.....	22	91	1	1883	20,000.00	19,997.75	2.25
Examination of fibers.....	.....do.....	22	91	1	1883	10,000.00	7,961.94	2,038.06
Investigating the diseases of domestic animals.....	.....do.....	22	92	1	1883	25,000.00	21,584.28	3,415.72
Reclamation of arid lands, including an unexpected balance of \$85.26 from fiscal year 1882.....	.....do.....	22	92	1	1883	20,085.26	12,429.13	(1)
Report on forestry.....	.....do.....	22	92	1	1883	10,000.00	8,731.99	1,268.01
Postage.....	.....do.....	22	92	1	1883	4,000.00	3,977.49	22.51
Contingent expenses.....	.....do.....	22	92	1	1883	15,000.00	14,920.74	79.26
Experiments in the manufacture of sugar, including an unexpended balance of \$3,530.85 from fiscal year 1882.....	.....do.....	22	92	1	1883	28,530.85	28,529.31	1.54
Erection of building for seed division.....	Aug. 7, 1882	22	306	1	1883	25,000.00	25,000.00	.....
Report on the Angora goat.....	.....do.....	22	337	1	1883	500.00	500.00	.....
Salaries.....	Jan. 20, 1883	22	408	1	1884	127,640.00	127,639.87	13
Collecting agricultural statistics.....	.....do.....	22	410	1	1884	80,000.00	79,770.86	229.14
Laboratory, and for experiments in the manufacture of sugar, including \$842.13 from the sale of sirup, etc.....	.....do.....	22	410	1	1884	16,842.18	16,829.26	12.92
Purchase and distribution of seeds, etc.....	.....do.....	22	410	1	1884	75,000.00	74,986.48	13.52
Experimental gardens and grounds.....	.....do.....	22	409	1	1884	15,500.00	15,448.87	51.13
Museum.....	.....do.....	22	409	1	1884	1,000.00	993.51	6.49
Furniture, cases, and repairs.....	.....do.....	22	410	1	1884	6,000.00	5,998.82	1.18
Library.....	.....do.....	22	411	1	1884	1,500.00	1,439.86	60.14
Investigating the history and habits of insects.....	.....do.....	22	409	1	1884	20,002.82	20,002.82	.....
Reclamation of arid lands, including an unexpended balance of \$7,656.13 from fiscal year 1883.....	Aug. 4, 1886	24	273	1				
Jan. 20, 1883	22	411	1	1884	17,656.13	16,164.68	1,491.45	
Investigating the diseases of domestic animals.....	.....do.....	22	411	1	1884	25,000.00	24,011.85	988.15
Report on forestry.....	.....do.....	22	411	1	1884	10,000.00	9,998.30	1.70
Postage.....	.....do.....	22	411	1	1884	4,000.00	3,841.48	158.52
Contingent expenses.....	.....do.....	22	411	1	1884	14,000.00	13,991.43	8.57
Building of greenhouse.....	.....do.....	22	631	1	1884	2,500.00	2,500.00	.....
Salaries.....	June 5, 1884	23	36	1	1885	137,590.00	137,557.50	32.20
Collecting agricultural statistics.....	.....do.....	23	38	1	1885	100,000.00	99,986.59	13.41
Bureau of Animal Industry.....	May 29, 1884	23	31	1	1885	150,000.00	56,807.73	(2)
Purchase and distribution of seeds, etc.....	June 5, 1884	23	38	1	1885	100,000.00	99,983.82	16.18
Laboratory, and for experiments in the manufacture of sugar.....	.....do.....	23	58	1	1885	50,000.00	49,996.70	3.30
Investigating the history and habits of insects.....	.....do.....	23	37	1	1885	20,000.00	19,986.83	13.17
Silk culture.....	.....do.....	23	39	1	1885	15,000.00	14,916.23	83.77
Contingent expenses.....	.....do.....	23	39	1	1885	15,000.00	14,862.20	137.80
Report on forestry.....	.....do.....	23	39	1	1885	10,000.00	9,987.36	12.64
Experimental garden and grounds.....	Oct. 19, 1888	25	581	1	1885	17,840.25	17,513.67	326.58
Furniture, cases, and repairs.....	June 5, 1884	23	38	1	1885	6,000.00	5,947.27	52.73
Postage.....	.....do.....	23	39	1	1885	4,000.00	3,956.98	43.02
Experiments in the culture, etc., of tea.....	.....do.....	23	39	1	1885	3,000.00	2,993.90	1.10
Library.....	.....do.....	23	39	1	1885	1,500.00	1,403.63	96.37

¹ Unexpended balance of \$7,656.13 carried to fiscal year 1884.

² Unexpended balance of \$93,192.27 carried to fiscal year 1880.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Museum.....	June 5, 1884	23	37	1	1885	\$1,000.00	\$1,000.00	.....
Quarantine stations.....	June 7, 1884	23	207	1	1885	25,000.00	22,029.18	(1)
Salaries.....	Mar. 3, 1885	23	353	1	1886	137,500.00	137,337.42	\$252.58
Collecting agricultural statistics.....	.....do.....	23	355	1	1886	75,000.00	68,723.06	6,276.94
Bureau of Animal Industry, including an unexpended balance of \$93,192.27 from fiscal year 1885.....	.....do.....	23	355	1	1886	193,192.27	58,261.05	134,931.22
Quarantine stations, including an unexpended balance of \$2,970.82 for fiscal year 1885.....	.....do.....	23	356	1	1886	32,970.82	18,958.57	14,012.25
Purchase and distribution of seeds, etc.....	.....do.....	23	354	1	1886	100,000.00	99,980.24	19.76
Laboratory, and for experiments in the manufacture of sugar.....	.....do.....	23	354	1	1886	40,000.00	39,942.11	57.89
Investigating the history and habits of insects.....	.....do.....	23	354	1	1886	25,000.00	24,976.46	23.54
Silk culture.....	{.....do..... Oct. 19, 1888	23 25	356 581	1	1886	15,012.00	15,008.50	3.50
Contingent expenses.....	Mar. 3, 1885	23	356	1				
Report on forestry.....	.....do.....	23	356	1	1886	15,000.00	14,937.62	62.38
Experimental garden and grounds.....	{.....do..... Aug. 4, 1886 Oct. 19, 1888	23 24 25	254 273 581	1	1886	17,208.13	17,024.88	183.25
Furniture, cases, and repairs.....	Mar. 3, 1885	23	354	1				
Postage.....	.....do.....	23	356	1	1886	7,500.00	7,423.59	76.41
Experiments in the culture, etc., of tea.....	.....do.....	23	356	1	1886	4,000.00	2,556.20	1,443.80
Library.....	.....do.....	23	356	1	1886	3,000.00	1,813.67	1,186.33
Museum.....	.....do.....	23	355	1	1886	1,500.00	1,417.03	82.97
Salaries.....	.....do.....	23	354	1	1886	1,000.00	998.88	1.12
Collecting agricultural statistics.....	June 30, 1886	24	100	1	1887	142,890.00	141,420.68	1,469.32
Bureau of Animal Industry.....	.....do.....	24	103	1	1887	65,000.00	64,955.14	44.86
Quarantine stations.....	.....do.....	24	103	1	1887	100,000.00	99,985.56	14.44
Purchase and distribution of seeds, etc.....	.....do.....	24	103	1	1887	30,000.00	10,639.44	19,360.56
Laboratory.....	.....do.....	24	102	1	1887	100,000.00	99,998.37	1.63
Experiments in the manufacture of sugar, including \$1,891 from sales.....	.....do.....	24	101	1	1887	6,000.00	4,570.86	1,429.14
Investigating the history and habits of insects.....	{.....do..... Oct. 19, 1888	24 25	101 582	1	1887	95,891.00	95,853.14	37.86
Silk culture, including \$864.81 from sale of raw silk.....	June 30, 1886	24	101	1				
Contingent expenses.....	{.....do..... Oct. 19, 1888	24 25	101 581	1	1887	15,939.56	15,939.56	.....
Report on forestry.....	June 30, 1886	24	104	1				
Experimental gardens and grounds.....	.....do.....	24	103	1	1887	15,000.00	14,936.83	63.17
Furniture, cases, and repairs.....	.....do.....	24	103	1	1887	8,000.00	7,953.50	46.50
Postage.....	.....do.....	24	102	1	1887	23,200.00	22,202.15	997.85
Experiments in the culture, etc., of tea.....	.....do.....	24	103	1	1887	8,125.00	8,092.11	32.89
Pomological information.....	.....do.....	24	104	1	1887	4,000.00	3,500.00	500.00
Library.....	.....do.....	24	104	1	1887	2,000.00	1,753.78	246.22
Botanical investigations.....	.....do.....	24	100	1	1887	3,000.00	2,993.20	6.80
Museum.....	.....do.....	24	103	1	1887	1,500.00	1,428.65	71.35
Ornithology and mammalogy.....	.....do.....	24	100	1	1887	5,000.00	4,983.12	11.88
Reclamation of arid lands.....	.....do.....	24	102	1	1887	1,000.00	998.88	1.12
Adulteration of food.....	.....do.....	24	101	1	1887	10,000.00	9,999.98	.02
Salaries.....	.....do.....	24	103	1	1887	5,000.00	.....	5,000.00
Collecting agricultural statistics.....	.....do.....	24	100	1	1887	1,000.00	989.14	10.86
Bureau of Animal Industry, including \$100,000 immediately available.....	Mar. 3, 1887	24	495	1	1888	161,490.00	158,220.87	3,269.13
Quarantine stations.....	.....do.....	24	498	1	1888	65,000.00	64,965.33	34.67
Purchase and distribution of seeds, etc.....	.....do.....	24	499	1	1888	500,000.00	499,975.32	24.68
.....	.....do.....	24	499	1	1888	20,000.00	9,538.75	10,461.25
.....	.....do.....	24	498	1	1888	103,000.00	102,587.55	412.45

¹ Unexpended balance of \$2,970.82 carried to fiscal year 1886.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Laboratory.....	Mar. 3, 1887	24	497	1	1888	\$5,000.00	\$5,969.89	\$30.11
Experiments in the manufacture of sugar.....	.....do.....	24	497	1	1888	50,000.00	49,907.43	2.57
Experiments in the manufacture of sugar (deficiency).....	{Oct. 19, 1888	25	582	1	{1887 1888}	8,000.00	7,927.50	72.50
Investigating the history and habits of insects.....	Mar. 3, 1887	24	497	1	1888	20,000.00	20,000.00	.....
Silk culture, including \$1,989.06 from sale of raw silk.....	.....do.....	24	497	1	1888	16,989.06	16,989.02	.04
Contingent expenses.....	.....do.....	24	499	1	1888	15,000.00	14,825.57	174.43
Report on forestry.....	.....do.....	24	499	1	1888	8,000.00	7,996.10	3.90
Experimental gardens and grounds.....	.....do.....	24	497	1	1888	24,800.00	24,706.86	93.14
Furniture, cases, and repairs.....	.....do.....	24	498	1	1888	7,000.00	6,982.88	17.12
Postage.....	.....do.....	24	499	1	1888	4,000.00	3,000.00	1,000.00
Pomological information.....	.....do.....	24	497	1	1888	3,000.00	2,971.09	28.31
Library.....	.....do.....	24	499	1	1888	2,000.00	1,983.78	16.22
Botanical investigations.....	.....do.....	24	496	1	1888	7,000.00	6,997.28	2.72
Museum.....	.....do.....	24	497	1	1888	1,000.00	947.41	52.59
Ornithology and mammalogy.....	.....do.....	24	497	1	1888	3,940.00	3,869.23	70.77
Adulteration of food.....	.....do.....	24	497	1	1888	1,000.00	830.16	169.84
Salaries.....	{July 18, 1888 Mar. 2, 1889	25 25	328 923	1	{1889	171,890.32	169,152.51	2,737.81
Collecting agricultural statistics.....	July 18, 1888	25	332	1	1889	70,000.00	69,162.45	837.55
Botanical investigations.....	.....do.....	25	330	1	1889	35,000.00	22,076.75	(¹)
Investigating the history and habits of insects.....	{Sept. 30, 1890 July 18, 1888	25 25	331 332	1	{1889	20,131.64	20,131.64	.....
Ornithology and mammalogy.....	{Mar. 2, 1889 Sept. 30, 1890 Mar. 3, 1891	25 26 26	838 525 886	1	{1889	5,025.90	5,022.06	3.84
Pomological information.....	July 18, 1888	25	330	1	1889	4,024.48	4,020.32	4.16
Microscopical investigations.....	.....do.....	25	330	1	1889	1,000.00	999.87	.13
Laboratory.....	{Mar. 2, 1889 July 18, 1888	25 25	837 333	1	{1889	11,000.00	9,994.25	1,005.75
Forestry investigations.....	.....do.....	25	333	1	1889	8,000.00	7,999.03	.97
Purchase and distribution of seeds.....	.....do.....	25	532	1	1889	104,200.00	104,168.73	31.27
Experimental gardens and grounds.....	.....do.....	25	332	1	1889	26,640.00	26,639.83	.17
Museum.....	.....do.....	25	332	1	1889	1,000.00	891.25	108.75
Furniture, cases, and repairs.....	.....do.....	25	333	1	1889	7,350.00	7,236.74	113.26
Library.....	.....do.....	25	333	1	1889	2,000.00	1,956.34	43.66
Postage.....	.....do.....	25	333	1	1889	4,000.00	4,000.00	.....
Contingent expenses.....	{Mar. 3, 1891 Mar. 18, 1888	26 25	881 334	1	{1889	15,010.00	15,009.22	.78
Office of Experiment Stations.....	.....do.....	25	334	1	1889	10,000.00	9,033.77	966.23
Experiments in the manufacture of sugar.....	.....do.....	25	333	1	1889	100,000.00	41,635.24	(¹)
Quarantine stations.....	.....do.....	25	333	1	1889	15,000.00	11,628.39	3,371.61
Bureau of Animal Industry.....	.....do.....	25	333	1	1889	500,000.00	479,623.57	20,376.43
Silk culture, including \$708.26 from sale of raw silk.....	.....do.....	25	331	1	1889	23,208.26	23,208.26	.....
Salaries.....	Mar. 2, 1889	25	835	1	1890	178,580.00	175,547.04	3,032.96
Collecting agricultural statistics.....	.....do.....	25	839	1	1890	75,000.00	74,327.51	672.49
Botanical investigations, including an unexpended balance of \$12,923.25 from fiscal year 1889.....	{.....do..... July 28, 1892	25 27	836 296	1	{1890	48,000.25	47,990.38	18.87
Investigating the history and habits of insects.....	Mar. 2, 1889	25	837	1	1890	20,000.00	19,892.72	107.28
Ornithology and mammalogy.....	{.....do..... July 14, 1890	25 26	838 285	1	{1890	7,000.00	6,994.16	5.84
Pomological information.....	{Mar. 2, 1889 Mar. 3, 1891	25 26	837 881	1	{1890	4,304.79	4,304.79	.....
Microscopical investigations.....	{Mar. 2, 1889 July 28, 1892	25 27	837 296	1	{1890	1,062.50	1,062.50	.....

¹ Unexpended balance of \$12,923.25 carried to fiscal year 1890.² Unexpended balance of \$58,364.76 carried to fiscal year 1890.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Laboratory.....	Mar. 2, 1889	25	837	1	1890	\$6,000.00	\$5,461.99	\$538.01
Forestry investigations.....	.....do.....	25	840	1	1890	8,000.00	7,999.96	.04
Purchase and distribution of seeds.....	.....do.....	25	839	1	1890	104,200.00	104,174.55	25.45
Experimental gardens and grounds.....	.....do.....	25	838	1	1890	26,640.00	26,478.45	161.55
Museum.....	.....do.....	25	838	1	1890	1,000.00	998.39	1.61
Furniture, cases, and repairs.....	.....do.....	25	839	1	1890	9,350.00	9,261.93	88.07
Library.....	Apr. 4, 1890	26	42	1	1890	2,000.00	1,738.28	261.72
Postage.....	Mar. 2, 1889	25	839	1	1890	4,000.00	4,000.00	.....
Contingent expenses.....	.....do.....	25	840	1	1890	20,000.00	19,965.32	34.68
Office of Experiment Stations.....	Apr. 4, 1890	26	42	1	1890	15,000.00	14,991.69	8.31
Experiments in the manufacture of sugar, including an unexpended balance of \$58,364.76 from fiscal year 1889.....	Mar. 2, 1889	25	840	1	1890	83,364.76	83,064.14	300.62
Quarantine stations.....	.....do.....	25	840	1	1890	15,000.00	11,266.24	3,733.76
Bureau of Animal Industry.....	.....do.....	25	839	1	1890	500,000.00	311,025.31	(1)
Silk culture, including \$1,627.81 from sale of raw silk.....	.....do.....	25	837	1	1890	21,627.81	21,626.10	1.71
Artesian wells.....	Apr. 4, 1890	26	42	1	1890	20,000.00	19,652.17	347.83
Salaries.....	July 14, 1890	26	282	1	1891	248,902.85	239,923.29	8,979.56
Collecting agricultural statistics.....	.....do.....	26	284	1	1891	100,000.00	85,126.44	14,873.56
Botanical investigations.....	.....do.....	26	284	1	1891	40,000.00	36,428.36	3,571.64
Investigating the history and habits of insects.....	.....do.....	26	285	1	1891	27,501.77	27,481.00	20.77
Ornithology and mammalogy.....	July 28, 1892	27	296	1	1891	14,004.90	13,003.67	1,001.23
Pomological information.....	July 14, 1890	26	285	1	1891	5,000.00	4,983.88	16.12
Microscopical investigations.....	.....do.....	26	285	1	1891	5,000.00	3,281.90	1,718.10
Vegetable pathology.....	.....do.....	26	285	1	1891	15,000.00	14,995.75	4.25
Laboratory.....	.....do.....	26	286	1	1891	20,200.00	19,985.27	214.73
Forestry investigations.....	.....do.....	26	286	1	1891	10,000.00	9,785.99	214.01
Illustrations and engravings.....	.....do.....	26	286	1	1891	2,000.00	1,999.58	.42
Purchase and distribution of seeds.....	.....do.....	26	286	1	1891	105,400.00	105,090.94	309.06
Document and folding room.....	.....do.....	26	287	1	1891	2,000.00	1,995.53	4.47
Experimental gardens and grounds.....	.....do.....	26	287	1	1891	28,500.00	28,396.41	103.59
Museum.....	.....do.....	26	287	1	1891	4,000.00	3,832.28	167.72
Furniture, cases, and repairs.....	.....do.....	26	287	1	1891	12,000.00	11,991.01	8.99
Library.....	Mar. 3, 1891	26	1049	1	1891	3,000.00	2,997.20	2.80
Postage.....	July 14, 1890	26	287	1	1891	5,000.00	4,833.00	167.00
Contingent expenses.....	.....do.....	26	287	1	1891	20,000.00	18,097.13	1,902.87
Office of Experiment Stations.....	.....do.....	26	288	1	1891	15,000.00	14,984.48	15.52
Experiments in the manufacture of sugar.....	.....do.....	26	288	1	1891	75,000.00	74,901.18	98.82
Irrigation investigations.....	Mar. 3, 1891	26	1050	1	1891	40,000.00	39,926.67	73.33
Quarantine stations.....	Sept. 30, 1890	26	525	1	1891	15,000.00	13,586.72	1,413.28
Bureau of Animal Industry, including an unexpended balance of \$188,974.69 from fiscal year 1890.....	July 14, 1890	26	288	1	1891	538,974.69	469,113.35	69,861.34
Silk culture, including \$565 from sale of raw silk.....	.....do.....	26	285	1	1891	20,565.00	19,536.33	1,028.67
Salaries.....	Mar. 3, 1891	26	1045	1	1892	256,800.00	252,766.17	4,033.83
Collecting agricultural statistics.....	.....do.....	26	1046	1	1892	102,500.00	88,869.51	13,630.49
Botanical investigations.....	.....do.....	26	1046	1	1892	40,246.40	40,246.40	.....
Investigating the history and habits of insects.....	Aug. 23, 1894	28	440	1	1892	27,800.00	27,780.03	19.97
Ornithology and mammalogy.....	Mar. 3, 1891	26	1047	1	1892	15,000.00	14,688.00	312.00
Pomological information.....	.....do.....	26	1047	1	1892	5,000.00	4,985.27	14.73
Microscopical investigations.....	.....do.....	26	1047	1	1892	2,000.00	1,251.46	748.54
Vegetable pathology.....	.....do.....	26	1047	1	1892	15,076.47	15,076.47	.....
	Aug. 23, 1894	28	440	1	1892			

¹ Unexpended balance of \$188,974.69 carried to fiscal year 1891.

*Statement of appropriations, disbursements, and unexpended balances for the United States
Department of Agriculture, etc.—Continued.*

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Laboratory.....	Mar. 3, 1891	26	1047	1	1892	\$19,400.00	\$19,272.59	\$127.41
Fiber investigations.....	do.....	26	1048	1	1892	10,000.00	8,017.44	1,982.56
Forestry investigations.....	do.....	26	1048	1	1892	15,056.85	15,056.85	
Illustrations and engravings.....	Mar. 3, 1893	27	660	1	1892			
Purchase and distribution of seeds.....	Mar. 3, 1891	26	1048	1	1892	2,000.00	1,999.85	.15
Document and folding room.....	do.....	26	1048	1	1892	105,400.00	104,920.35	479.65
Experimental gardens and grounds.....	do.....	26	1049	1	1892	2,000.00	1,996.82	3.18
Museum.....	do.....	26	1049	1	1892	28,622.53	28,536.67	85.86
Furniture, cases, and repairs.....	Mar. 3, 1893	27	660	1	1892	4,000.00	3,909.17	90.83
Library.....	Mar. 3, 1891	26	1049	1	1892	10,000.00	9,996.55	3.45
Postage.....	do.....	26	1049	1	1892	3,000.00	2,807.75	192.25
Contingent expenses.....	do.....	26	1049	1	1892	5,000.00	4,900.00	100.00
Office of Experiment Stations.....	do.....	26	1049	1	1892	25,000.00	24,762.32	237.68
Experiments in the manufacture of sugar.....	do.....	26	1050	1	1892	20,000.00	19,989.47	10.53
Quarantine stations.....	do.....	26	1050	1	1892	35,000.00	34,627.78	372.22
Bureau of Animal Industry.....	Mar. 18, 1892	27	7	1	1892	15,000.00	14,983.63	16.37
Weather Bureau.....	do.....	26	1045	1	1892	650,000.00	649,980.91	19.09
Salaries.....	Mar. 3, 1891	27	7	1	1892	889,753.50	861,840.83	27,912.67
Collecting agricultural statistics.....	July 5, 1892	26	1051	1	1893	256,800.00	253,896.30	2,903.70
Botanical investigations and experiments.....	do.....	27	76	1	1893	110,000.00	95,649.21	14,350.79
Investigating the history and habits of insects.....	do.....	27	76	1	1893	27,500.00	27,451.55	48.45
Investigations in ornithology and mammalogy.....	do.....	27	77	1	1893	17,800.00	17,290.80	509.20
Pomological information.....	do.....	27	77	1	1893	15,000.00	14,947.77	52.23
Microscopical investigations.....	do.....	27	77	1	1893	5,000.00	4,745.94	254.06
Vegetable pathology.....	do.....	27	77	1	1893	2,000.00	1,982.98	17.02
Laboratory.....	do.....	27	77	1	1893	20,000.00	19,977.38	22.62
Fiber investigations.....	do.....	27	77	1	1893	19,400.00	18,002.59	1,397.41
Forest investigations.....	do.....	27	78	1	1893	5,000.00	4,997.07	2.93
Illustrations and engravings.....	do.....	27	78	1	1893	12,000.00	11,933.39	66.61
Purchase and distribution of seeds.....	do.....	27	78	1	1893	2,000.00	1,906.73	93.27
Document and folding room.....	do.....	27	78	1	1893	135,400.00	134,908.27	491.73
Experimental gardens and grounds.....	do.....	27	78	1	1893	2,000.00	1,623.55	376.45
Museum.....	do.....	27	78	1	1893	28,500.00	28,115.09	384.91
Furniture, cases, and repairs.....	do.....	27	79	1	1893	4,000.00	3,973.67	26.33
Library.....	do.....	27	79	1	1893	10,000.00	8,931.97	1,068.03
Postage.....	do.....	27	79	1	1893	3,000.00	2,535.29	464.71
Contingent expenses.....	do.....	27	79	1	1893	5,000.00	3,705.00	1,295.00
Experiment stations.....	do.....	27	79	1	1893	25,000.00	22,218.19	2,781.81
Experiments in the manufacture of sugar.....	do.....	27	80	1	1893	20,000.00	18,987.65	1,012.35
Irrigation investigations.....	do.....	27	80	1	1893	20,000.00	19,984.86	15.14
Quarantine stations.....	do.....	27	76	1	1893	6,000.00	4,930.67	1,069.33
Experiments in the production of rainfall.....	do.....	27	80	1	1893	15,000.00	12,633.23	2,366.77
Bureau of Animal Industry.....	do.....	27	76	1	1893	10,000.00	4,979.59	5,020.41
Weather Bureau.....	do.....	27	79	1	1893	850,000.00	724,696.74	125,303.26
Salaries.....	Mar. 3, 1893	27	81	1	1893	913,660.72	890,424.77	23,235.95
Collecting agricultural statistics.....	do.....	27	734	1	1894	256,800.00	233,679.75	23,120.25
Botanical investigations and experiments.....	do.....	27	736	1	1894	110,000.00	91,080.20	18,919.80
Investigating the history and habits of insects.....	do.....	27	737	1	1894	30,000.00	24,401.40	5,598.60
Investigations in ornithology and mammalogy.....	do.....	27	737	1	1894	20,300.00	16,203.96	4,096.04
Pomological information.....	do.....	27	737	1	1894	17,500.00	17,450.00	50.00
Microscopical investigations.....	do.....	27	738	1	1894	5,000.00	4,248.99	751.01
Vegetable pathology.....	do.....	27	738	1	1894	2,000.00	1,117.55	882.45
Laboratory.....	do.....	27	738	1	1894	20,000.00	17,576.95	2,423.05
Fiber investigations.....	do.....	27	738	1	1894	21,900.00	10,426.79	11,473.21
Forestry investigations.....	do.....	27	738	1	1894	5,000.00	2,500.47	2,499.53
Illustrations and engravings.....	do.....	27	738	1	1894	20,000.00	19,995.96	4.04
	do.....	27	738	1	1894	2,000.00	664.79	1,335.21

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Purchase and distribution of seeds.....	Mar. 3, 1893	27	733	1	1894	\$135,400.00	\$119,719.76	\$15,680.24
Document and folding room.....	do	27	739	1	1894	2,000.00	1,662.81	337.19
Experimental gardens and grounds.....	do	27	739	1	1894	31,500.00	26,616.86	4,883.14
Museum.....	do	27	739	1	1894	4,000.00	2,787.22	1,212.78
Furniture, cases, and repairs.....	do	27	739	1	1894	10,000.00	8,628.76	1,371.24
Library.....	do	27	739	1	1894	3,000.00	2,900.07	99.93
Postage.....	do	27	740	1	1894	5,000.00	1,375.00	3,625.00
Contingent expenses.....	do	27	740	1	1894	25,000.00	20,493.04	4,506.96
Experiment stations.....	do	27	740	1	1894	25,223.50	22,381.85	2,841.65
Inquiries relating to public roads.....	do	27	737	1	1894	10,000.00	2,997.39	7,002.61
Experiments in the manufacture of sugar.....	do	27	741	1	1894	20,107.33	9,451.80	10,655.53
Irrigation investigations.....	do	27	741	1	1894	6,000.00	5,475.92	524.08
Quarantine stations.....	do	27	740	1	1894	15,000.00	6,263.92	8,736.08
Bureau of Animal Industry.....	do	27	740	1	1894	850,000.00	496,111.34	353,888.66
Weather Bureau.....	do	27	741	1	1894	951,124.75	811,256.73	139,868.02
Salaries.....	Aug. 18, 1894	28	266	1	1895	249,876.16	204,589.72	45,286.44
Collecting agricultural statistics.....	do	28	266	1	1895	110,000.00	95,125.67	14,874.33
Botanical investigations and experiments.....	do	28	267	1	1895	30,000.00	25,695.30	4,304.70
Investigating the history and habits of insects.....	do	28	267	1	1895	20,300.00	16,822.87	3,477.13
Investigations in ornithology, etc.....	do	28	267	1	1895	17,500.00	15,526.35	1,973.65
Pomological information.....	do	28	267	1	1895	5,000.00	4,920.23	79.77
Microscopical investigations.....	do	28	267	1	1895	2,000.00	313.87	1,686.13
Vegetable pathological investigations, etc.....	do	28	267	1	1895	20,000.00	19,063.69	936.31
Laboratory.....	do	28	267	1	1895	14,900.00	11,010.50	3,889.50
Fiber investigations.....	do	28	271	1	1895	5,000.00	3,973.81	1,026.19
Report on forestry.....	do	28	268	1	1895	20,000.00	19,908.23	91.77
Illustrations and engravings.....	do	28	268	1	1895	15,000.00	9,114.71	5,885.29
Purchase and distribution of valuable seeds.....	do	28	269	1	1895	165,400.00	120,545.15	44,854.85
Document and folding room.....	do	28	268	1	1895	2,000.00	1,166.83	833.17
Experimental gardens and grounds.....	do	28	268	1	1895	29,500.00	23,578.11	5,921.89
Museum.....	do	28	271	1	1895	3,000.00	1,889.73	1,110.27
Furniture, cases, and repairs.....	do	28	271	1	1895	10,000.00	7,952.27	2,047.73
Library.....	do	28	272	1	1895	6,000.00	5,963.20	36.80
Postage.....	do	28	271	1	1895	5,000.00	765.00	4,235.00
Nutrition investigations.....	do	28	271	1	1895	10,000.00	9,746.30	253.70
Contingent expenses.....	do	28	272	1	1895	25,000.00	20,452.79	4,547.21
Agricultural experiment stations.....	do	28	271	1	1895	25,000.00	24,928.22	71.78
Inquiries relating to public roads.....	do	28	266	1	1895	10,000.00	6,901.66	3,098.34
Experiments in the manufacture of sugar.....	do	28	271	1	1895	10,000.00	6,188.80	3,811.20
Irrigation investigations.....	do	28	271	1	1895	6,000.00	3,904.88	2,095.12
Quarantine stations for neat cattle.....	do	28	269	1	1895	12,000.00	6,262.17	5,737.83
Bureau of Animal Industry.....	do	28	269	1	1895	800,000.00	534,028.38	265,971.62
Weather Bureau.....	do	28	272	1	1895	878,438.84	820,691.94	57,746.90
Salaries.....	Mar. 2, 1895	28	727	1	1896	252,840.00	217,066.97	35,773.03
Collecting agricultural statistics.....	do	28	729	1	1896	110,000.00	68,628.99	41,371.01
Inquiries relating to public roads.....	do	28	729	1	1896	10,000.00	9,568.39	431.61
Botanical investigations and experiments.....	do	28	730	1	1896	25,000.00	20,325.37	4,674.63
Investigating the history and habits of insects.....	do	28	730	1	1896	20,000.00	17,372.43	2,627.57
Investigations in ornithology and mammalogy.....	do	28	730	1	1896	17,500.00	16,175.45	1,324.55
Pomological information.....	do	28	730	1	1896	6,000.00	4,996.41	1,003.59
Microscopical investigations.....	do	28	730	1	1896	2,000.00		2,000.00
Vegetable pathological investigations and experiments.....	do	28	730	1	1896	20,000.00	18,539.18	1,460.82

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Laboratory.....	Mar. 2, 1895	28	730	1	1896	\$14,900.00	\$11,458.53	\$3,441.47
Report on forestry.....	do.	28	731	1	1896	25,000.00	18,398.12	6,601.88
Illustrations and engravings.....	do.	28	731	1	1896	15,000.00	12,985.71	2,014.29
Document and folding room.....	do.	28	731	1	1896	2,000.00	1,061.23	938.77
Experimental gardens and grounds.....	do.	28	731	1	1896	29,500.00	22,371.15	7,128.85
Quarantine stations for neat cattle.....	do.	28	733	1	1896	12,000.00	6,492.05	5,507.95
Purchase and distribution of valuable seeds.....	do.	28	733	1	1896	185,400.00	126,476.87	58,923.13
Experiments in the manufacture of sugar.....	do.	28	734	1	1896	10,000.00	1,510.94	8,489.06
Agricultural experiment stations (\$750,000 ¹).....	do.	28	734	1	1896	² 30,143.75	27,712.86	2,430.89
Irrigation investigations.....	do.	28	735	1	1896	15,000.00	5,029.82	9,970.18
Nutrition investigations.....	do.	28	735	1	1896	15,000.00	14,892.96	107.04
Investigations and experiments with grasses and forage plants.....	do.	28	735	1	1896	15,000.00	13,329.47	1,670.53
Investigations in relation to agricultural soils.....	do.	28	735	1	1896	15,000.00	13,524.84	1,475.16
Furniture, cases, and repairs.....	do.	28	735	1	1896	10,000.00	8,645.98	1,354.02
Postage.....	do.	28	735	1	1896	2,000.00	1,215.00	785.00
Museum.....	do.	28	735	1	1896	3,000.00	2,161.90	838.10
Fiber investigations.....	do.	28	735	1	1896	5,000.00	3,710.36	1,289.64
Library.....	do.	28	735	1	1896	6,000.00	5,431.92	568.08
Contingent expenses.....	do.	28	736	1	1896	25,000.00	15,912.71	9,087.29
Bureau of Animal Industry.....	do.	28	731	1	1896	800,000.00	595,336.64	204,663.36
Weather Bureau.....	do.	28	736	1	1896	³ 885,729.47	814,584.17	71,145.30
Salaries.....	Apr. 25, 1896	29	99	1	1897	313,860.00	290,791.95	23,068.05
Furniture, cases, and repairs.....	do.	29	105	1	1897	12,000.00	9,567.59	2,432.41
Library.....	do.	29	104	1	1897	7,000.00	6,831.15	168.85
Museum.....	do.	29	105	1	1897	3,000.00	2,895.45	104.55
Postage.....	do.	29	105	1	1897	3,000.00	1,730.60	1,270.00
Contingent expenses.....	do.	29	105	1	1897	25,000.00	22,980.29	2,019.71
Animal quarantine stations.....	do.	29	105	1	1897	12,000.00	6,564.19	5,435.81
Collecting agricultural statistics.....	do.	29	101	1	1897	110,000.00	83,067.62	26,932.38
Botanical investigations and experiments.....	do.	29	101	1	1897	15,000.00	14,999.64	.36
Entomological investigations.....	do.	29	102	1	1897	20,000.00	18,637.01	1,362.99
Vegetable pathological investigations.....	do.	29	102	1	1897	20,000.00	19,274.15	725.85
Biological investigations.....	do.	29	102	1	1897	17,500.00	17,483.05	16.95
Pomological investigations.....	do.	29	102	1	1897	6,000.00	4,981.52	1,018.48
Laboratory.....	do.	29	102	1	1897	12,400.00	10,800.18	1,599.82
Forestry investigations.....	do.	29	103	1	1897	20,000.00	19,514.88	485.12
Experimental gardens and grounds.....	do.	29	103	1	1897	20,000.00	19,483.28	516.72
Soil investigations.....	do.	29	103	1	1897	10,000.00	9,868.16	131.84
Grass and forage plant investigations.....	do.	29	103	1	1897	10,000.00	9,203.14	796.86
Fiber investigations.....	do.	29	103	1	1897	5,000.00	4,143.00	\$57.00
Agricultural experiment stations (\$750,000 ¹).....	do.	29	103	1	1897	⁴ 30,127.25	29,171.57	955.68
Nutrition investigations.....	do.	29	104	1	1897	15,000.00	14,821.64	178.36
Public road inquiries.....	do.	29	104	1	1897	8,000.00	7,873.97	126.03
Publications.....	do.	29	104	1	1897	70,000.00	67,709.89	2,290.11
Purchase and distribution of valuable seeds.....	do.	29	106	1	1897	150,000.00	142,822.52	7,177.48
Bureau of Animal Industry.....	do.	29	106	1	1897	650,000.00	642,715.68	7,284.32
Weather Bureau.....	do.	29	107	1	1897	⁵ 883,876.28	870,581.46	13,294.82
Salaries, officers and clerks.....	Apr. 23, 1897	30	1	1	1898	319,300.00	285,181.30	5,118.70
Furniture, cases, and repairs.....	do.	30	8	1	1898	9,000.00	18,962.98	37.02
Library.....	do.	30	7	1	1898	7,000.00	9,811.02	188.98
							7,851.30	1,148.70
							6,734.81	265.19

¹ Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department.² Includes \$143.75 from the sale of card index.³ Includes \$119.47 from the sale of Weather Bureau publications.⁴ Includes \$127.25 from the sale of card index.⁵ Includes \$104.28 from the sale of Weather Bureau publications.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Museum.....	Apr. 23, 1897	30	8	1	1898	\$3,000.00	\$2,906.02	\$93.98
Postage.....	do.....	30	8	1	1898	3,000.00	1,500.00	1,500.00
Contingent expenses.....	do.....	30	8	1	1898	25,000.00	22,061.73	2,938.27
Animal quarantine stations.....	do.....	30	7	1	1898	12,000.00	10,897.98	1,102.02
Collecting agricultural statistics.....	do.....	30	3	1	1898	110,000.00	92,896.01	7,103.99
Botanical investigations and experiments.....	do.....	30	4	1	1898	15,000.00	9,021.09	978.91
Entomological investigations.....	do.....	30	4	1	1898	20,000.00	14,714.50	285.50
Vegetable pathological investigations.....	do.....	30	4	1	1898	20,000.00	19,735.02	264.98
Biological investigations.....	do.....	30	4	1	1898	17,500.00	18,966.67	373.33
Pomological investigations.....	do.....	30	4	1	1898	8,000.00	660.00	
Laboratory.....	do.....	30	5	1	1898	12,400.00	16,160.90	1,339.10
Forestry investigations.....	do.....	30	5	1	1898	20,000.00	7,487.93	512.07
Experimental gardens and grounds.....	do.....	30	5	1	1898	25,000.00	3,913.86	86.14
Soil investigations.....	do.....	30	5	1	1898	10,000.00	6,718.71	781.29
Grass and forage plant investigations.....	do.....	30	6	1	1898	10,000.00	19,831.32	168.68
Fiber investigations.....	do.....	30	6	1	1898	5,000.00	24,937.31	62.69
Agricultural experiment stations (\$755,000 ¹).....	do.....	30	6	1	1898	35,000.00	9,199.82	140.12
Nutrition investigations.....	do.....	30	6	1	1898	15,000.00	660.00	
Public road inquiries.....	do.....	30	7	1	1898	8,000.00	8,877.68	1,122.32
Publications, including Farmers' Bulletins.....	do.....	30	7	1	1898	65,000.00	3,659.05	1,340.95
Investigating production of domestic sugar.....	do.....	30	39	1	1898	5,000.00	29,413.10	586.90
Purchase and distribution of valuable seeds.....	do.....	30	8	1	1898	130,000.00	4,925.80	74.20
Salaries and expenses, Bureau of Animal Industry.....	do.....	30	9	1	1898	675,000.00	14,872.88	127.12
Weather Bureau.....	do.....	30	9	1	1898	883,702.00	7,978.44	21.56
Salaries, officers and clerks.....	Mar. 22, 1898	30	330	1	1899	319,300.00	34,966.55	33.45
Furniture, cases, and repairs.....	do.....	30	336	1	1899	9,000.00	29,812.59	187.41
Library.....	do.....	30	336	1	1899	6,000.00		
Museum.....	do.....	30	336	1	1899	1,500.00		
Postage.....	do.....	30	336	1	1899	2,000.00		
Contingent expenses.....	do.....	30	337	1	1899	25,000.00		
Animal quarantine stations.....	do.....	30	336	1	1899	12,000.00		
Collecting agricultural statistics.....	do.....	30	333	1	1899	105,000.00		
Botanical investigations and experiments.....	do.....	30	333	1	1899	20,000.00		
Entomological investigations.....	do.....	30	333	1	1899	20,000.00		
Vegetable pathological investigations.....	do.....	30	333	1	1899	20,000.00		
Biological investigations.....	do.....	30	334	1	1899	17,500.00		
Pomological investigations.....	do.....	30	334	1	1899	9,500.00		
Laboratory.....	do.....	30	334	1	1899	12,400.00		
Forestry investigations.....	do.....	30	334	1	1899	20,000.00		
Experimental gardens and grounds.....	do.....	30	334	1	1899	20,000.00		
Soil investigations.....	do.....	30	334	1	1899	10,000.00		
Grass and forage plant investigations.....	do.....	30	335	1	1899	10,000.00		
Irrigation information.....	do.....	30	335	1	1899	10,000.00		
Agricultural experiment stations (\$760,000 ¹).....	do.....	30	335	1	1899	40,000.00		
Nutrition investigations.....	do.....	30	335	1	1899	15,000.00		
Public road inquiries.....	do.....	30	336	1	1899	8,000.00		
Publications.....	do.....	30	336	1	1899	65,000.00		
Purchase and distribution of valuable seeds.....	do.....	30	337	1	1899	130,000.00		
Investigating production of domestic sugar.....	do.....	30	338	1	1899	7,000.00		

¹ Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Salaries and expenses, Bureau of Animal Industry.....	Mar. 22, 1898	30	338	1	1899	\$900,000.00	\$920,164.47	6,828.45
Weather Bureau.....	do.....	30	339	1	1899	1,015,502.00	1,008,971.30	6,530.70
Salaries, officers and clerks.....	Mar. 1, 1899	30	947	1	1900	336,340.00	330,666.24	5,673.76
Furniture, cases, and repairs.....	do.....	30	955	1	1900	10,000.00	9,771.27	228.73
Library.....	do.....	30	954	1	1900	5,000.00	4,291.17	708.83
Museum.....	do.....	30	954	1	1900	1,500.00	1,490.01	9.99
Postage.....	do.....	30	954	1	1900	2,000.00	2,000.00	.....
Contingent expenses.....	do.....	30	955	1	1900	25,000.00	23,769.38	1,230.62
Animal quarantine stations.....	do.....	30	954	1	1900	12,000.00	11,477.87	522.13
Collecting agricultural statistics.....	do.....	30	950	1	1900	110,000.00	107,653.62	2,346.38
Botanical investigations and experiments.....	do.....	30	950	1	1900	20,000.00	19,689.51	310.49
Entomological investigations.....	do.....	30	951	1	1900	20,000.00	19,920.64	79.36
Vegetable pathological investigations.....	do.....	30	951	1	1900	26,000.00	25,854.44	145.56
Biological investigations.....	do.....	30	951	1	1900	17,500.00	17,344.00	156.00
Pomological investigations.....	do.....	30	951	1	1900	9,500.00	9,099.61	400.39
Laboratory.....	do.....	30	951	1	1900	17,700.00	17,182.80	517.20
Forestry investigations.....	do.....	30	952	1	1900	40,000.00	39,991.49	8.51
Experimental gardens and grounds.....	do.....	30	952	1	1900	28,000.00	27,589.66	410.34
Soil investigations.....	do.....	30	952	1	1900	20,000.00	19,717.02	282.98
Grass and forage plant investigations.....	do.....	30	952	1	1900	12,000.00	11,566.84	433.16
Irrigation investigations.....	do.....	30	953	1	1900	35,000.00	33,732.57	1,267.43
Agricultural experiment stations (\$765,000 ²).....	do.....	30	953	1	1900	45,000.00	43,702.20	1,297.80
Nutrition investigations.....	do.....	30	953	1	1900	15,000.00	14,950.86	49.14
Public road inquiries.....	do.....	30	954	1	1900	8,000.00	7,854.35	145.65
Publications.....	do.....	30	954	1	1900	80,000.00	79,516.76	483.24
Purchase and distribution of valuable seeds.....	do.....	30	955	1	1900	130,000.00	128,366.13	1,633.87
Investigating production of domestic sugar.....	do.....	30	956	1	1900	7,000.00	6,717.82	282.18
Tea-culture investigations.....	do.....	30	956	1	1900	1,000.00	999.33	.67
Salaries and expenses, Bureau of Animal Industry.....	do.....	30	956	1	1900	950,000.00	918,449.03	31,550.97
Weather Bureau.....	do.....	30	957	1	1900	1,022,482.00	1,014,238.80	8,243.20
Salaries, officers and clerks.....	May 20, 1900	31	191	1	1901	326,680.00	319,809.25	6,870.75
Library.....	do.....	31	194	1	1901	5,000.00	4,118.93	881.07
Contingent expenses.....	do.....	31	194	1	1901	37,000.00	35,623.95	1,376.05
Animal quarantine stations.....	do.....	31	194	1	1901	50,000.00	49,343.52	656.48
Collecting agricultural statistics.....	do.....	31	194	1	1901	110,000.00	109,729.76	270.24
Botanical investigations and experiments.....	do.....	31	195	1	1901	30,000.00	29,590.49	409.51
Entomological investigations.....	do.....	31	195	1	1901	22,500.00	22,265.57	234.43
Vegetable pathological investigations.....	do.....	31	195	1	1901	28,000.00	27,488.57	511.43
Biological investigations.....	Mar. 1, 1899	31	196	1	1901	17,500.00	17,195.83	304.17
Pomological investigations.....	do.....	31	196	1	1901	9,500.00	9,315.11	184.89
Laboratory.....	do.....	31	196	1	1901	28,500.00	28,395.45	104.55
Forestry investigations.....	do.....	31	197	1	1901	80,000.00	79,095.87	304.13
Experimental gardens and grounds.....	do.....	31	197	1	1901	20,000.00	19,986.72	13.28
Soil investigations.....	do.....	31	197	1	1901	25,000.00	24,924.94	75.06
Grass and forage plant investigations.....	do.....	31	198	1	1901	17,000.00	15,225.83	1,774.17
Irrigation investigations.....	do.....	31	199	1	1901	50,000.00	49,973.09	26.91
Agricultural experiment stations (\$780,000 ²).....	do.....	31	198	1	1901	\$ 60,251.01	59,883.47	367.54
Nutrition investigations.....	do.....	31	199	1	1901	17,500.00	17,499.67	.33
Arlington experimental farm.....	do.....	31	199	1	1901	10,000.00	9,946.03	53.97
Public road inquiries.....	do.....	31	200	1	1901	14,000.00	13,990.76	9.24
Publications.....	do.....	31	200	1	1901	105,000.00	104,080.67	319.33
Purchase and distribution of valuable seeds.....	do.....	31	200	1	1901	170,000.00	149,615.49	20,384.51

¹ Includes \$26,992.92 received from sale of American products in Europe.² Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department³ Including \$251.01 received from sales of card index.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Investigating production of domestic sugar.....	Mar. 1, 1899	31	201	1	1901	\$7,000.00	\$6,690.25	\$309.75
Tea-culture investigations.....	.....do.....	31	202	1	1901	5,000.00	4,959.42	40.58
Salaries and expenses, Bureau of Animal Industry.....	.....do.....	31	202	1	1901	11,000,514.96	976,566.75	23,948.21
Salaries, Weather Bureau.....	.....do.....	31	202	1	1901	153,320.00	152,688.11	631.89
Fuel, lights, and repairs, Weather Bureau.....	.....do.....	31	203	1	1901	9,000.00	8,877.36	122.64
Contingent expenses, Weather Bureau.....	.....do.....	31	203	1	1901	8,000.00	7,906.40	93.60
General expenses, Weather Bureau.....	.....do.....	31	203	1	1901	828,000.00	823,921.78	4,078.22
Meteorological Observation Stations, Weather Bureau.....	.....do.....	31	204	1	1901	60,000.00	59,019.49	980.51
Salaries.....	Mar. 2, 1901	31	922	1	1902	373,820.00	370,039.69	3,780.31
Library.....	.....do.....	31	934	1	1902	7,000.00	6,754.06	245.94
Contingent expenses.....	.....do.....	31	934	1	1902	37,000.00	34,543.24	2,456.76
Animal quarantine stations.....	.....do.....	31	926	1	1902	25,000.00	24,814.88	185.12
Collecting agricultural statistics.....	.....do.....	31	934	1	1902	120,000.00	117,060.06	2,939.94
Botanical investigations and experiments.....	.....do.....	31	928	1	1902	45,000.00	44,950.93	49.07
Entomological investigations.....	.....do.....	31	931	1	1902	28,513.18	27,069.77	1,443.41
Vegetable pathological investigations.....	.....do.....	31	927	1	1902	60,000.00	59,999.45	.55
Biological investigations.....	.....do.....	31	932	1	1902	20,000.00	19,807.80	192.20
Pomological investigations.....	.....do.....	31	927	1	1902	20,000.00	19,985.14	14.86
Laboratory.....	.....do.....	31	930	1	1902	24,500.00	24,417.47	82.53
Forestry investigations.....	.....do.....	31	929	1	1902	146,280.00	145,809.76	470.24
Experimental gardens and grounds.....	.....do.....	31	929	1	1902	20,000.00	19,725.80	274.20
Soil investigations.....	.....do.....	31	931	1	1902	91,000.00	89,987.21	1,012.79
Grass and forage plant investigations.....	.....do.....	31	928	1	1902	20,000.00	19,566.91	433.09
Irrigation investigations.....	.....do.....	31	936	1	1902	50,000.00	49,980.86	19.14
Agricultural experiment stations (\$780,000 2).....	.....do.....	31	935	1	1902	3,69,157.05	69,052.71	104.34
Nutrition investigations.....	.....do.....	31	936	1	1902	20,000.00	19,951.48	48.52
Arlington experimental farm.....	.....do.....	31	936	1	1902	10,000.00	9,897.16	102.84
Plans for building Department of Agriculture, 1901-2.....	.....do.....	31	938	1	1902	5,000.00	5,000.00	.....
Public road inquiries.....	.....do.....	31	933	1	1902	20,000.00	19,957.01	42.99
Publications.....	.....do.....	31	933	1	1902	188,000.00	187,657.52	342.48
Purchase and distribution of valuable seeds.....	.....do.....	31	937	1	1902	270,000.00	266,614.22	3,385.78
Investigating production of domestic sugar.....	.....do.....	31	936	1	1902	5,000.00	4,346.31	653.69
Tea-culture investigations.....	.....do.....	31	937	1	1902	7,000.00	6,816.25	183.75
Bureau of Animal Industry.....	.....do.....	31	925	1	1902	1,092,190.28	1,092,100.94	89.34
Weather Bureau:								
Salaries.....	.....do.....	31	923	1	1902	159,820.00	159,769.71	50.29
Fuel, lights, and repairs.....	.....do.....	31	923	1	1902	9,000.00	8,919.71	80.29
Contingent expenses.....	.....do.....	31	923	1	1902	8,000.00	7,942.81	57.19
General expenses.....	.....do.....	31	923	1	1902	865,500.00	864,490.74	1,009.26
Meteorological observation stations.....	.....do.....	31	924	1	1902	60,000.00	59,646.49	353.51
Buildings.....	.....do.....	31	924	1	1902	46,000.00	46,000.00	.....
Salaries.....	June 3, 1902	32	286	1	1903	465,500.00	450,976.17	14,523.83
Library.....	.....do.....	32	300	1	1903	8,000.00	7,635.11	364.89
Contingent expenses.....	.....do.....	32	301	1	1903	37,000.00	42,916.14	83.86
Urgent deficiency, contingent.....	.....do.....	32	1062	1	1903	6,000.00		
Vegetable pathological investigations.....	.....do.....	32	291	1	1903	105,000.00	103,646.28	1,353.72
Vegetable pathological investigations, 1902-3.....	.....do.....	32	1152	1	1903	5,000.00	4,130.02	869.98
Pomological investigations.....	.....do.....	32	291	1	1903	30,000.00	29,606.83	393.17
Botanical investigations and experiments.....	.....do.....	32	292	1	1903	55,000.00	54,900.42	99.58

¹ Including \$514.96 received from sales of American butter in foreign markets.

² Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department.

³ Including \$157.05 received from sales of card index.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Grass and forage plant investigations.....	June 3, 1902	32	292	1	1903	\$30,000.00	\$29,527.41	\$472.59
Experimental gardens and grounds.....	do.....	32	293	1	1903	25,000.00	24,935.74	64.26
Arlington Experimental Farm.....	do.....	32	293	1	1903	15,000.00	14,998.81	1.19
Investigating production of domestic sugar.....	do.....	32	295	1	1903	5,000.00	4,065.10	934.90
Tea-culture investigations.....	do.....	32	293	1	1903	10,000.00	7,500.10	2,499.90
Purchase and distribution of valuable seeds.....	do.....	32	293	1	1903	270,000.00	266,229.81	3,770.19
Forestry investigations.....	do.....	32	295	1	1903	254,000.00	244,781.68	9,218.32
Laboratory.....	do.....	32	296	1	1903	60,500.00	59,518.91	918.09
Soil investigations.....	do.....	32	297	1	1903	130,000.00	128,408.15	1,591.85
Entomological investigations.....	do.....	32	298	1	1903	37,500.00	37,485.44	14.56
Entomological investigations, 1902-3.....	do.....	32	298	1	1903	8,000.00	7,989.42	10.58
Biological investigations.....	do.....	32	298	1	1903	26,000.00	25,616.80	383.20
Biological investigations, 1902-3.....	do.....	32	298	1	1903	2,000.00	1,949.61	50.39
Urgent deficiency publications.....	do.....	32	1062	1	1903	200,000.00	190,961.49	13,038.51
Collecting agricultural statistics.....	do.....	32	300	1	1903	4,000.00		
Agricultural experiment stations (\$796,000 ¹).....	do.....	32	301	1	1903	94,200.00	94,023.27	176.73
Amount of deposits.....	do.....	32	301	1	1903	76,000.00	77,552.69	333.31
Nutrition investigations.....	do.....	32	302	1	1903	\$1,886.00		
Irrigation investigations.....	do.....	32	302	1	1903	20,000.00	19,901.12	98.88
Public road inquiries.....	do.....	32	302	1	1903	65,000.00	62,201.12	2,798.88
Foreign market investigations.....	do.....	32	302	1	1903	30,000.00	29,996.13	3.87
Silk investigations.....	do.....	32	300	1	1903	6,500.00	6,140.02	359.98
Expenses, Bureau of Animal Industry.....	do.....	32	303	1	1903	10,000.00	7,133.32	2,866.68
Urgent deficiency, Bureau of Animal Industry.....	do.....	32	289	1	1903	1,660,000.00	1,444,113.05	215,886.95
Weather Bureau:								
Salaries.....	do.....	32	286	1	1903	165,260.00	164,927.46	332.54
Fuel, lights, and repairs.....	do.....	32	287	1	1903	10,000.00	9,964.65	35.35
Contingent expenses.....	do.....	32	287	1	1903	8,000.00	7,806.38	193.62
General expenses.....	do.....	32	287	1	1903	915,000.00	428,219.74	1,280.76
Meteorological observation stations.....	do.....	32	288	1	1903	60,000.00	480,377.71	5,622.29
Buildings.....	do.....	32	288	1	1903	50,000.00	59,628.24	371.76
Cables and land lines.....	do.....	32	288	1	1903	40,000.00	49,467.00	533.00
Storm-warning stations, Glenhaven and South Manitou Island, Mich.....	do.....	32	288	1	1903	15,000.00	40,000.00	.....
Salaries, Department of Agriculture, officers and clerks.....	Mar. 3, 1903	32	1147	1	1904	470,080.00	458,295.90	11,784.10
Salaries, extra laborers.....	do.....	32	1147	1	1904	1,000.00	982.01	17.99
Bureau of Animal Industry:								
General expenses, including \$1,800 for rent of building.....	do.....	32	1150	1	1904	1,200,000.00	1,199,410.98	589.02
To eradicate contagious diseases of animals.....	do.....					250,000.00	249,868.64	131.06
Bureau of Plant Industry:								
Vegetable pathological investigations.....	do.....	32	1152	1	1904	122,000.00	122,889.98	.06
Rent of building.....	do.....	32	1152	1	1904	3,000.00	2,109.96	
Vegetable pathological investigations, 1903-4.....	do.....	32	1152	1	1904	5,000.00	4,998.41	1.59
Pomological investigations.....	do.....	32	1153	1	1904	37,000.00	35,636.08	1,363.92
Botanical investigations and experiments.....	do.....	32	1153	1	1904	62,000.00	60,693.23	1,306.77
Rent of building.....	do.....	32	1153	1	1904	3,000.00	3,000.00	.....
Grass and forage plant investigations.....	do.....	32	1154	1	1904	33,800.00	34,514.48	235.52
Rent of building.....	do.....	32	1154	1	1904	1,200.00	250.00	

¹ Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department.² Receipts from sales of certain products of Alaska, Hawaii, and Porto Rico experiment stations.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Bureau of Plant Industry—Con.								
Experimental gardens and grounds, Department of Agriculture.....	Mar. 3, 1903	32	1154	1	1904	\$25,000.00	\$24,984.11	\$15.89
Arlington Experimental Farm.....	do.	22	1155	1	1904	15,000.00	14,972.99	27.01
Tea-culture investigations.....	do.	32	1155	1	1904	10,000.00	8,701.07	1,298.93
Purchase and distribution of valuable seeds.....	do.	32	1155	1	1904	257,000.00	257,247.74	256.26
Foreign seed and plant introduction.....	do.	32	1155	1	1904	30,000.00	27,483.93	2,012.07
Rent of building.....	do.	32	1156	1	1904	3,000.00		3,000.00
Investigating production of domestic sugar.....	do.	32	1156	1	1904	5,000.00	4,249.41	750.59
Bureau of Forestry:								
Forestry investigations, including \$10,000 for rent of building.....	do.	32	1156	1	1904	312,860.00	311,588.63	1,271.37
Protection of forest reserves ¹	do.					16,864.01	341.12	16,522.89
Bureau of Chemistry:								
Laboratory, including \$5,000 for table sirup.....	do.	32	1157	1	1904	60,500.00	60,317.39	182.61
Laboratory, table sirup, 1903-4.....	do.	32	1157	1	1904	10,000.00	9,898.89	101.11
Bureau of Soils, including \$2,000 for rent of building.....	do.	32	1159	1	1904	170,000.00	166,286.32	3,713.68
Entomological investigations.....	do.	32	1160	1	1904	43,500.00	39,114.76	4,385.24
Silk investigations.....	do.	32	1160	1	1904	10,000.00	9,055.31	944.69
Entomological investigations, 1903-4.....	do.	32	1160	1	1904	12,000.00	11,825.82	174.18
Biological investigations, including \$1,000 for care of game.....	do.	32	1160	1	1904	34,000.00	33,066.92	933.08
Publications, Department of Agriculture, Farmers' Bulletins.....	do.	32	1161	1	1904	105,000.00	104,997.90	2.10
Artists, etc.....	do.	32	1161	1	1904	10,000.00	9,992.49	7.51
Labor, etc.....	do.	32	1161	1	1904	85,000.00	84,746.73	253.27
Collecting agricultural statistics.....	do.	32	1162	1	1904	104,200.00	103,225.80	974.10
Collecting agricultural statistics, 1903-4.....	do.	32	1162	1	1904	5,000.00	4,996.84	3.16
Foreign market investigations.....	do.	32	1162	1	1904	7,500.00	7,455.40	44.60
Library, Department of Agriculture.....	do.	32	1163	1	1904	10,000.00	9,972.93	27.07
Contingent expenses, Department of Agriculture.....	do.	32	1163	1	1904	37,000.00	36,999.77	.23
Agricultural experiment stations (\$810,000 ²).....	do.	32	1163	1	1904	40,000.00	39,997.74	2.26
Stations of Alaska.....	do.	32	1164	1	1904	15,000.00	15,000.00	
Stations of Hawaii.....	do.	32	1164	1	1904	15,000.00	15,000.00	
Stations of Porto Rico.....	do.	32	1164	1	1904	15,000.00	15,000.00	
Farmers' institutes.....	do.	32	1164	1	1904	5,000.00	4,838.69	161.31
Nutrition investigations.....	do.	32	1164	1	1904	20,000.00	19,994.18	5.82
Irrigation investigations.....	do.	32	1165	1	1904	65,000.00	64,938.65	61.35
Public road inquiries.....	do.	32	1165	1	1904	32,000.00	31,813.00	187.00
Public road inquiries, 1903-4.....	do.	32	1165	1	1904	3,000.00	3,000.00	
Weather Bureau:								
Salaries.....	do.	32	1148	1	1904	175,440.00	175,098.94	341.06
Fuel, lights, and repairs.....	do.	32	1148	1	1904	6,000.00	5,981.63	18.37
Contingent expenses.....	do.	32	1148	1	1904	8,000.00	7,818.82	181.48
General expenses, salaries.....	do.	32	1149	1	1904	472,300.00	471,917.22	382.78
General expenses, miscellaneous.....	do.	32	1149	1	1904	496,780.00	494,741.03	2,038.97
Buildings.....	do.	32	1149	1	1904	50,000.00	50,000.00	
Cables and land lines.....	do.	32	1149	1	1904	40,000.00	40,000.00	
Salaries, officers and clerks.....	Apr. 23, 1904	33	276	1	1905	481,300.00	467,998.89	10,301.11
Salaries, extra laborers.....	do.	33	277	1	1905	1,000.00	971.66	28.34

¹ This appropriation and amount transferred from Department of Interior.² Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Bureau of Animal Industry:								
Deficiency appropriation.....	Apr. 23, 1904	33	1242	1	1905	\$150,000.00		
General expenses, including \$1,800 for rent of building.....	do.....	33	279	1	1905	1,250,000.00	\$1,399,227.96	\$772.04
Animal breeding and feeding.....	do.....	33	281	1	1905	25,000.00	20,540.67	4,459.33
To eradicate contagious diseases of animals, 1904-5 ¹	do.....	33	5	1	1905	250,000.00	248,980.79	1,019.21
Bureau of Plant Industry:								
Vegetable pathological investigations.....	do.....	33	281	1	1905	145,000.00	145,705.01	
Rent of building.....	do.....	33	281	1	1905	3,000.00	2,294.99	
Vegetable pathological investigations, 1904-5.....	do.....	33	281	1	1905	2,000.00	2,000.00	
Rent of quarters (deficiency).....	do.....	33	603	1	1905	2,500.00	2,485.00	15.00
Pomological investigations ²	do.....	33	282	1	1905	43,500.00	41,280.58	2,219.42
Botanical investigations and experiments.....	do.....	33	283	1	1905	64,500.00	63,914.24	585.76
Rent of building.....	do.....	33	283	1	1905	3,000.00	3,000.00	
Grass and forage plant investigations.....	do.....	33	283	1	1905	40,500.00	40,012.04	487.96
Rent of building.....	do.....	33	283	1	1905	2,000.00	1,500.00	500.00
Experimental gardens and grounds, Department of Agriculture.....	do.....	33	284	1	1905	25,000.00	24,725.40	274.60
Greenhouses, Department of Agriculture, 1904-5.....	do.....	33	284	1	1905	25,000.00	24,995.32	4.68
Arlington Experimental Farm.....	do.....	33	284	1	1905	20,000.00	19,838.70	161.30
Tea-culture investigations.....	do.....	33	284	1	1905	10,000.00	8,387.15	1,612.85
Purchase and distribution of valuable seeds ³	do.....	33	285	1	1905	242,500.00	240,379.71	2,120.29
Foreign seed and plant introduction ³	do.....	33	286	1	1905	40,000.00	39,687.44	312.56
Repairs to building.....	do.....	33	285	1	1905	7,500.00	4,000.00	3,500.00
Investigating production of domestic sugar.....	do.....	33	286	1	1905	7,500.00	7,222.14	277.86
Bureau of Forestry:								
Forestry investigations, including \$15,500 for rent of building.....	do.....	33	286	1	1905	388,000.00	386,618.32	1,381.68
Protection of forest reserves.....	do.....	32	286	1	1905	50,000.00	49,025.23	974.77
Testing timbers, Louisiana Purchase Exposition, St. Louis, Mo. (deficiency act).....	do.....	33	1242	1	1905	10,000.00	9,985.82	14.18
Bureau of Chemistry:								
Laboratory, including \$15,000 for table sirup.....	do.....	33	287	1	1905	105,000.00	103,693.95	1,306.05
Laboratory, 1904-5.....	do.....	33	288	1	1905	15,000.00	14,716.95	283.05
Laboratory road materials.....	do.....	33	288	1	1905	15,000.00	14,802.99	197.01
Bureau of Soils:								
Soil investigations, including \$6,000 for rent of building.....	do.....	33	288	1	1905	170,000.00	168,638.84	1,361.16
Entomological investigations.....	do.....	33	289	1	1905	70,000.00	69,124.44	875.56
Cotton-boll weevil investigations, 1904-5 ¹	do.....	33	5	1	1905	250,000.00	220,685.40	29,314.60
Biological investigations.....	do.....	33	290	1	1905	33,000.00	32,937.70	62.30
Biological investigations, 1904-5, care of elk.....	do.....	33	291	1	1905	1,000.00	807.14	192.86
Publications, Department of Agriculture, farmers' bulletins.....	do.....	33	291	1	1905	105,000.00	104,885.16	114.84
Artists, etc.....	do.....	33	291	1	1905	15,000.00	14,635.28	364.72
Labor, etc.....	do.....	32	291	1	1905	89,000.00	88,985.64	14.36
Labor, etc., 1904-5.....	do.....	33	291	1	1905	1,000.00	430.64	569.36
Collecting agricultural statistics.....	do.....	33	292	1	1905	132,000.00	130,539.73	1,460.27

¹ By transfer from cotton-boll weevil to Bureau of Animal Industry, 1904-5, \$3,500.00.

² By receipts from sale of fruits and vegetables (pomological investigations), \$2,426.21.

By transfer from foreign to domestic seeds, \$4,183.54.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Foreign-market investigations.....	Apr. 23, 1904	33	292	1	1905	\$7,500.00	\$6,069.72	\$1,430.28
Library, Department of Agriculture.....	do.....	33	293	1	1905	10,000.00	9,640.28	359.72
Contingent expenses, Department of Agriculture.....	do.....	33	293	1	1905	37,000.00	36,963.20	36.80
Agricultural experiment stations (\$810,000 ¹).....	do.....	33	293	1	1905	40,000.00	39,703.10	296.90
Stations of Alaska.....	do.....	33	294	1	1905	15,000.00	15,000.00	.....
Stations of Hawaii.....	do.....	33	294	1	1905	15,000.00	15,000.00	.....
Stations of Porto Rico.....	do.....	33	294	1	1905	15,000.00	15,000.00	.....
Farmers' institutes.....	do.....	33	294	1	1905	5,000.00	4,003.53	396.47
Nutrition investigations.....	do.....	33	294	1	1905	20,000.00	19,976.98	23.02
Irrigation investigations.....	do.....	33	294	1	1905	67,500.00	67,416.35	83.65
Public road inquiries.....	do.....	33	295	1	1905	35,000.00	34,319.03	680.97
Building, Department of Agriculture.....	do.....	32	806	1	1905	250,000.00	108,496.32	141,503.68
Weather Bureau:								
Salaries.....	do.....	33	277	1	1905	180,440.00	180,225.57	214.43
Fuel, lights, and repairs.....	do.....	33	278	1	1905	8,000.00	7,979.20	20.80
Contingent expenses.....	do.....	33	278	1	1905	10,000.00	9,702.00	297.40
General expenses, salaries.....	do.....	33	278	1	1905	492,300.00	491,725.31	574.69
General expenses, miscellaneous.....	do.....	33	279	1	1905	572,000.00	569,424.01	2,575.99
Buildings.....	do.....	33	279	1	1905	48,000.00	47,803.11	196.89
Cables and land lines.....	do.....	33	279	1	1905	27,000.00	26,991.09	8.91
Salaries, officers and clerks.....	Mar. 3, 1905	33	861	1	1906	804,970.00	783,042.64	21,927.36
Salaries, extra labor.....	do.....	33	861	1	1906	10,000.00	9,120.34	879.66
Bureau of Animal Industry:								
Deficiency act.....	Feb. 27, 1906				1906			
General expenses (including \$63,000 deficiency).....	Mar. 3, 1905	33	864	1	1906	1,492,020.00	1,405,951.28	86,068.72
Animal breeding and feeding.....	do.....	33	866	1	1906	25,000.00	24,429.56	570.44
Rent of buildings.....	do.....	33	865	1	1906	2,500.00	1,802.00	698.00
Bureau of Plant Industry:								
Vegetable pathological investigations.....	do.....	33	867	1	1906	139,640.00	135,320.51	4,319.49
Rent of building.....	do.....	33	867	1	1906	6,000.00	3,720.00	2,280.00
Vegetable pathological investigations, 1905-6.....	do.....	33	868	1	1906	10,000.00	9,560.46	439.54
Grain investigations.....	do.....	33	868	1	1906	25,000.00	23,843.68	1,156.32
Pomological investigations.....	do.....	33	868	1	1906	33,640.00	33,639.02	.38
Rent of building.....	do.....	33	868	1	1906	2,000.00	2,000.00	.....
Botanical investigations and experiments.....	do.....	33	869	1	1906	60,840.00	59,338.00	1,501.40
Rent of building.....	do.....	33	869	1	1906	3,000.00	3,000.00	.....
Grass and forage plant investigations.....	do.....	33	869	1	1906	37,160.00	33,279.00	3,881.00
Rent of building.....	do.....	33	869	1	1906	2,500.00	2,490.00	10.00
Experimental gardens and grounds.....	do.....	33	870	1	1906	15,320.00	15,273.75	46.25
Experimental gardens and grounds, 1905-6.....	do.....	33	870	1	1906	5,000.00	4,978.00	22.00
Arlington experimental farm.....	do.....	33	870	1	1906	20,000.00	19,667.35	332.65
Tea-culture investigations.....	do.....	33	870	1	1906	8,500.00	7,944.83	555.17
Purchase and distribution of valuable seeds.....	do.....	33	870	1	1906	205,140.00	202,767.39	2,372.61
Foreign seed and plant introduction.....	do.....	33	871	1	1906	37,780.00	32,429.83	5,350.17
Investigating production of domestic sugar.....	do.....	33	872	1	1906	7,500.00	7,317.54	182.46
Forest Service:								
General expenses, Forest Service.....	do.....	33	872	1	1906	768,180.00	767,722.04	457.96
Rent of buildings.....	do.....	33	873	1	1906	25,000.00	25,000.00	.....
Bureau of Chemistry:								
Laboratory, including \$3,000 for table sirup.....	do.....	33	873	1	1906	130,920.00	128,289.99	2,630.01
Bureau of Soils:								
Soil investigations, including \$4,000 for rent of building.....	do.....	33	875	1	1906	170,000.00	167,403.73	2,596.27

¹ Of this amount \$720,000 was paid directly to the experiment stations from the Treasury Department.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Bureau of Entomology: Entomological investigations, including \$2,500 for moth investigations.....	Mar. 3, 1905	33	876	1	1906	\$68,060.00	\$65,457.52	\$2,602.48
Bureau of Biological Survey: Biological investigations.....	.....do.....	33	877	1	1906	44,420.00	44,064.71	355.29
Division of Publications: Publications, Department of Agriculture, Farmers' Bulletins.....	.....do.....	33	878	1	1906	98,750.00	98,601.49	148.51
Artists, etc.....	.....do.....	33	878	1	1906	3,500.00	3,434.10	65.90
Labor, etc.....	.....do.....	33	879	1	1906	30,000.00	29,767.04	232.96
Bureau of Statistics: Collecting agricultural statistics.....	.....do.....	33	879	1	1906	93,900.00	90,007.12	3,892.88
Foreign market investigations.....	.....do.....	33	879	1	1903	4,900.00	4,720.13	179.87
Library, Department of Agriculture.....	.....do.....	33	880	1	1906	8,040.00	7,411.73	628.27
Contingent expenses, Department of Agriculture.....	.....do.....	33	880	1	1906	35,000.00	34,878.55	121.45
Contingent expenses, 1905-6.....	.....do.....	33	880	1	1906	2,000.00	2,000.00	.....
Agricultural experiment stations (\$1,034,660 ¹).....	.....do.....	33	881	1	1906	21,660.00	20,908.90	751.10
Stations of Alaska, including \$3,000 for purchase of live stock.....	.....do.....	33	881	1	1906	18,000.00	18,000.00	.....
Stations of Hawaii.....	.....do.....	33	881	1	1906	15,000.00	15,000.00	.....
Stations of Porto Rico.....	.....do.....	33	881	1	1906	15,000.00	15,000.00	.....
Farmers' institutes.....	.....do.....	33	882	1	1906	5,000.00	4,550.52	449.48
Nutrition investigations.....	.....do.....	33	882	1	1906	20,000.00	19,805.11	194.89
Irrigation investigations.....	.....do.....	33	882	1	1906	74,200.00	74,044.61	155.39
Public-road inquiries.....	.....do.....	33	882	1	1906	37,660.00	36,479.77	1,180.23
Cotton-boll weevil investigations.....	.....do.....	33	883	1	1906	190,000.00	154,671.59	35,328.41
Weather Bureau: Salaries.....	.....do.....	33	862	1	1906	191,430.00	190,930.72	499.28
Fuel, lights, and repairs.....	.....do.....	33	862	1	1906	10,000.00	9,926.33	73.67
Contingent expenses.....	.....do.....	33	863	1	1906	10,000.00	9,841.53	158.47
Salaries, station employees.....	.....do.....	33	863	1	1906	531,550.00	530,662.89	887.11
General expenses.....	.....do.....	33	863	1	1906	562,010.00	553,143.78	8,866.22
Buildings.....	.....do.....	33	863	1	1906	53,000.00	52,748.43	251.57
Cables and land lines.....	.....do.....	33	864	1	1906	35,000.00	34,121.31	878.69
Salaries, officers and clerks.....	June 30, 1906	34	670	1	1907	750,170.00	731,284.77	18,885.23
Salaries, extra labor.....	.....do.....	34	670	1	1907	7,600.00	6,430.73	1,169.27
Contingent expenses.....	.....do.....	34	692	1	1907	37,000.00	36,603.13	396.87
Library.....	.....do.....	34	691	1	1907	10,000.00	9,518.47	481.53
Bureau of Animal Industry: General expenses.....	.....do.....	34	673	1	1907	809,700.00	745,546.97	64,153.03
Rent of buildings.....	.....do.....	34	673	1	1907	2,500.00	2,481.00	19.00
Southern dairy work.....	.....do.....	34	674	1	1907	20,000.00	17,762.01	2,237.99
Diseases of domestic animals, Minnesota.....	.....do.....	34	674	1	1907	5,000.00	1,691.76	3,308.24
Animal breeding and feeding.....	.....do.....	34	674	1	1907	25,000.00	24,361.92	638.08
Meat inspection.....	.....do.....	34	674	1	1907	3,000,000.00	2,163,907.68	836,092.32
Eradicating cattle ticks: 1907.....	.....do.....	34	696	1	1907	82,500.00	81,328.30	1,171.70
1907 and 1908.....	Mar. 4, 1907	34	1281	1	1907	25,000.00	14,188.10	10,811.90
Bureau of Plant Industry: General expenses.....	June 30, 1906	34	680	1	1907	480,406.25	470,153.84	8,801.16
Rent and repairs.....	.....do.....	34	681	1	1907	11,300.00	11,216.75	83.25
Ozark Mountain investigations.....	.....do.....	34	681	1	1907	3,553.72	4,993.44	6.56
Grain investigations.....	.....do.....	34	681	1	1907	15,000.00	14,903.23	96.77
Improving roads.....	.....do.....	34	681	1	1907	3,500.00	3,474.10	25.90
Purchase and distribution of valuable seeds.....	.....do.....	34	682	1	1907	205,140.00	201,004.98	4,135.02
Foreign seed and plant introduction.....	.....do.....	34	682	1	1907	35,781.21	33,834.64	1,946.57

¹ Of this amount \$960,000 was paid directly to the experiment stations from the Treasury Department.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Bureau of Plant Industry—Con. Purchase and distribution of valuable seeds—Contd. Erection of building at Chico, Cal.	June 30, 1906	34	683	1	1907	\$1,998.79	\$1,998.79	(1)
Cotton-boll weevil investigations: 1907.....	do.....	34	695	1	1907	105,000.00	101,832.47	\$3,167.53
1907 and 1908.....	Mar. 4, 1907	34	1280	1	1907	40,000.00	39,999.63	.37
Bureau of Chemistry: Laboratory.....	June 30, 1906	34	685	1	1907	145,920.00	142,174.00	3,746.00
Enforcement of the food and drugs act.....	Dec. 19, 1906	34	841	1	1907	250,000.00	100,279.95	149,720.05
Bureau of Soils: Soils investigations.....	June 30, 1906	34	687	1	1907	181,000.00	179,910.62	1,089.38
Rent of buildings.....	do.....	34	687	1	1907	4,000.00	3,920.00	80.00
Bureau of Entomology: Entomological investigations.....	do.....	34	688	1	1907	70,000.00	69,114.27	885.73
White-fly investigations.....	do.....	34	688	1	1907	5,000.00	4,902.34	97.66
Cotton-boll weevil investigations.....	do.....	34	695	1	1907	85,000.00	64,873.54	20,126.46
Preventing spread of moths: 1907.....	do.....	34	696	1	1907	82,500.00	81,993.24	506.76
1907 and 1908.....	Mar. 4, 1907	34	1281	1	1907	150,000.00	8,592.73	141,407.27
Bureau of Biological Survey: Biological investigations.....	June 30, 1906	34	688	1	1907	44,420.00	43,975.22	444.78
Division of Publications: Publications, Farmers' Bulletins.....	do.....	34	690	1	1907	98,750.00	98,601.18	148.82
Artists, etc.....	do.....	34	690	1	1907	3,500.00	3,387.46	112.54
Labor, etc.....	do.....	34	690	1	1907	30,000.00	29,836.21	163.79
Bureau of Statistics: Collecting agricultural statistics.....	do.....	34	691	1	1907	108,000.00	105,466.40	2,533.60
Foreign markets investigations.....	do.....	34	691	1	1907	4,900.00	4,852.95	47.05
Office of Experiment Stations: Agricultural experiment stations (\$803,500 ²).....	do.....	34	693	1	1907	25,500.00	697,210.54	48,289.46
Farmers' institutes.....	do.....	34	693	1	1907	5,000.00	4,765.85	234.15
Station at Alaska, including \$3,000 for purchase of live stock.....	do.....	34	693	1	1907	18,000.00	17,987.49	12.51
Station at Hawaii, including \$5,000 for water supply.....	do.....	34	693	1	1907	20,000.00	19,998.75	1.25
Station at Porto Rico.....	do.....	34	693	1	1907	15,000.00	15,000.00	(1)
Nutrition investigations.....	do.....	34	694	1	1907	20,000.00	19,990.99	9.01
Irrigation investigations.....	do.....	34	694	1	1907	122,200.00	121,638.29	561.71
Office of Public Roads: Public road inquiries.....	do.....	34	694	1	1907	57,660.00	56,833.94	826.06
Weather Bureau: Salaries.....	do.....	34	671	1	1907	194,690.00	193,918.11	771.89
Fuel, lights, and repairs.....	do.....	34	671	1	1907	10,000.00	9,923.49	71.51
Contingent expenses.....	do.....	34	671	1	1907	10,000.00	9,912.56	87.44
Salaries, station employees.....	do.....	34	672	1	1907	541,550.00	540,702.30	847.70
General expenses.....	do.....	34	672	1	1907	630,000.00	616,415.03	13,584.97
Buildings.....	do.....	34	672	1	1907	53,000.00	51,727.28	1,272.72
Forest Service: Salaries, officers and clerks.....	June 30, 1906	34	683	1	1907	112,860.00	112,133.16	726.84
General expenses.....	do.....	34	683	1	1907	849,640.00	849,265.94	374.06
Rent.....	do.....	34	685	1	1907	35,000.00	29,050.36	5,949.64
Building on Dismal River Forest Reserve.....	do.....	34	696	1	1907	2,500.00	2,475.22	24.78
Wichita Forest and Game Preserve.....	do.....	34	696	1	1907	15,000.00	14,999.00	1.00
Survey and report on Appalachian and White Mountain watersheds, 1907 and 1908.....	Mar. 4, 1907	34	1281	1	1907	25,000.00	857.14	24,142.86

¹ Exhausted.

² This includes \$720,000 for State experiment stations paid through the Treasury Department. Congress also appropriated \$336,000 for State experiment stations under the Adams bill to be paid through the Treasury Department. Total paid through the Treasury Department for State experiment stations, \$1,056,000. Congress also appropriated in the sundry civil bill for printing and binding \$300,000.

Statement of appropriations, disbursements, and unexpended balances for the United States
Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Forest Service—Continued.								
Administration, etc., of the National Forests, 1907 and 1908.	Mar. 4, 1907	34	1270	1	1907	\$125,000.00	\$6,213.21	\$118,786.79
Special appropriations:								
Pomological investigations, fund from sale of fruits and vegetables.	Apr. 23, 1904	33	382	1	1905	3,744.74	3,744.64	.10
Agricultural experiment stations, fund from sale of card indexes.	do.	33	293	1	1905	65.15	65.15	(1)
Buildings, Department of Agriculture.	Mar. 3, 1903	32	1139	}	}	250,000.00		
Balance available July 1, 1906.	Mar. 3, 1905	32	1211			700,000.00		
Sundry civil act.	June 30, 1906	34	758			480,934.68		
Administration, etc., forest reserves.						300,000.00	535,594.61	245,340.07
Cooperative work, forest investigations.						925,000.00	812,293.34	112,706.66
Salaries, officers and clerks.	Mar. 4, 1907	34	1256	1	1908	21,410.25	16,612.05	4,798.20
Salaries, extra labor.	do.	34	1256	1	1908	969,090.00	947,454.88	21,635.12
Contingent expenses.	do.	34	1277	1	1908	7,600.00	7,592.28	7.72
Library.	do.	34	1277	1	1908	47,000.00	46,435.97	564.03
Bureau of Animal Industry:								
General expenses.	do.	34	1259	1	1908	12,500.00	12,498.43	1.57
Diseases of domestic animals, Minnesota.	do.	34	1259	1	1908	892,200.00	878,938.39	13,261.61
Animal breeding and feeding.	do.	34	1260	1	1908	5,000.00	2,970.01	2,029.99
Meat inspection.	June 30, 1906	34	674	1	1908	50,000.00	49,649.15	350.85
Eradicating cattle ticks:						3,000,000.00	2,725,034.27	274,965.73
1908.	Mar. 4, 1907	34	1281	1	1908	125,000.00	122,444.15	2,555.85
1907 and 1908 (appropriated \$25,000; balance July 1, 1907).	do.	34	1281	1	1908	10,811.90	10,811.90	(1)
Bureau of Plant Industry:								
General expenses, 1908-9.	do.	34	1266	1	1908	10,000.00	9,992.61	7.39
General expenses.	do.	34	1267	1	1908	515,484.25	572,635.62	848.63
Rent and repairs.	do.	34	1267	1	1908	11,295.75	11,295.75	(1)
Grain investigations.	do.	34	1267	1	1908	40,000.00	39,862.20	137.80
Purchase and distribution of valuable seeds (includes \$50,000, deficiency act).	do.	34	1267	1	1908	252,000.00	249,864.82	2,135.18
Foreign seed and plant introduction.	do.	34	1267	1	1908	36,000.00	35,487.38	512.62
Cotton boll weevil investigations, 1908.	do.	34	1280	1	1908	110,000.00	109,513.44	486.56
Bureau of Chemistry: Laboratory.	do.	34	1271	1	1908	650,000.00	611,925.10	38,074.90
Bureau of Soils:								
Soil investigations.	do.	34	1272	1	1908	166,000.00	165,589.19	410.81
Rent of buildings.	do.	34	1273	1	1908	4,000.00	3,486.66	513.34
Bureau of Entomology:								
Entomological investigations.	do.	34	1273	1	1908	103,800.00	101,416.46	2,383.54
White fly investigations.	do.	34	1274	1	1908	10,000.00	9,530.04	469.96
Cotton boll weevil investigations.	do.	34	1280	1	1908	40,000.00	38,396.83	1,603.17
Preventing spread of moths, 1907 and 1908 (appropriated \$150,000; balance July 1, 1907).	do.	34	1280	1	1908	141,407.27	132,475.59	8,931.68
Bureau of Biological Survey:								
Biological investigations.	do.	34	1274	1	1908	44,420.00	44,261.67	158.33
Division of Publications: Publications ¹ .	do.	34	1275	1	1908	35,000.00	34,888.63	111.37
Bureau of Statistics:								
Collecting agricultural statistics.	do.	34	1276	1	1908	118,000.00	117,917.44	82.56
Foreign markets investigations.	do.	34	1276	1	1908	4,900.00	4,705.02	194.98

¹ Exhausted.² Congress also appropriated, in the sundry civil bill, for printing and binding \$433,760.

Statement of appropriations, disbursements, and unexpended balances for the United States
Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Office of Experiment Stations:								
Agricultural experiment stations (\$327,000)¹	Mar. 4, 1907	34	1278	1	1908	\$30,000.00	\$28,341.73	\$1,658.27
Farmers' institutes.....do.....	do.....	34	1279	1	1908	5,000.00	4,931.47	68.53
Station at Alaska.....do.....	do.....	34	1278	1	1908	24,000.00	23,995.29	4.71
Station at Hawaii.....do.....	do.....	34	1278	1	1908	24,000.00	23,994.94	5.06
Station at Porto Rico.....do.....	do.....	34	1278	1	1908	24,000.00	24,000.00	(²)
Nutrition investigations.....do.....	do.....	34	1279	1	1908	5,000.00	1,758.98	3,241.02
Irrigation investigations.....do.....	do.....	34	1279	1	1908	150,000.00	149,305.43	694.57
Office of Public Roads:								
Public road inquiries.....do.....	do.....	34	1280	1	1908	55,560.00	55,592.98	67.02
Rent and repairs.....do.....	do.....	34	1280	1	1908	2,000.00	1,879.93	120.07
Weather Bureau:								
Salaries.....do.....	do.....	34	1257	1	1908	196,990.00	196,250.16	739.84
Fuel, lights, and repairs.....do.....	do.....	34	1258	1	1908	10,000.00	9,884.15	115.85
Contingent expenses.....do.....	do.....	34	1258	1	1908	10,000.00	9,815.34	184.66
Salaries, station employees.....do.....	do.....	34	1258	1	1908	551,550.00	550,545.99	1,004.01
General expenses.....do.....	do.....	34	1258	1	1908	645,000.00	593,211.46	51,788.54
Forest Service:								
General expenses.....do.....	do.....	34	1269	1	1908	1,696,800.00	1,702,007.47	1,578.17
Rent (joint resolution, Jan. 7, 1908, increasing rent).....do.....	do.....	34	1270	1	1908	60,000.00	53,214.36	
Administration, etc., of National Forests, 1908.....do.....	do.....	34	1270	1	1908	375,000.00	374,034.44	965.56
Survey and report on Appalachian and White Mountain watersheds, 1907 and 1908 (appropriated \$25,000; balance July 1, 1907).....do.....	do.....	34	1281	1	1908	23,403.76	15,845.37	7,558.39
Administration, etc., of National Forests, 1907 and 1908 (appropriated \$125,000; balance July 1, 1907).....do.....	do.....	34	1270	1	1908	118,786.79	118,786.29	.50
Special appropriations:								
Buildings, Department of Agriculture (\$1,500,000)—								
Balance available July 1, 1909.....	Mar. 3, 1903	32	1139	---	---	1,251.10	968.40	282.70
Paper tests.....	Mar. 3, 1905	33	1211	---	---	10,000.00	9,974.13	25.87
Salaries, officers and clerks.....	May 23, 1908	35	251	1	1909	879,660.00	856,891.19	22,768.81
Salaries, extra labor.....do.....	do.....	35	251	1	1909	7,600.00	7,410.85	189.15
Contingent expenses.....do.....	do.....	35	265	1	1909	86,200.00	85,851.79	348.21
Library.....do.....	do.....	35	264	1	1909	15,500.00	15,484.39	15.61
Bureau of Animal Industry:								
General expenses.....do.....	Feb. 9, 1909	35	616	1	1909	\$1,247,200.00	1,214,792.71	32,407.29
Animal breeding and feeding.....	Mar. 4, 1909	35	927	1				
Meat inspection.....	May 23, 1908	35	255	1				
Eradicating cattle ticks—	June 30, 1906	34	674	1	1909	3,000,000.00	2,887,100.05	112,899.95
1909.....	May 23, 1908	35	268	1	1909	225,000.00	202,797.16	22,202.84
1908 and 1909.....do.....	do.....	35	268	1	1909	25,000.00	25,000.00	(³)
Bureau of Plant Industry:								
General expenses, 1909.....do.....	do.....	35	256	1	1909	886,266.00	873,605.23	12,660.77
Purchase and distribution of valuable seeds, \$202,000.....do.....	do.....	35	257	1	1909	258,000.00	201,378.40	621.60
Foreign seed and plant introduction, \$56,000.....do.....	do.....	35	260	1	1909	\$860,000.00	55,377.46	622.54
Bureau of Chemistry: Laboratory.....do.....	Feb. 9, 1909	35	616	1			826,830.62	33,169.38
Bureau of Soils: Soil investigations.....do.....	May 23, 1908	35	261	1	1909	200,000.00	199,415.09	584.91

¹ This includes \$720,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department. Congress also appropriated \$432,000 as a permanent appropriation for State experiment stations under the Adams bill, to be paid through the Treasury Department. Total to be paid through the Treasury Department for State experiment stations, \$1,152,000.

² Exhausted.

³ Including \$150,000, deficiency act, Feb. 9, 1909, and \$150,000 by deficiency act, Mar. 4, 1909.

⁴ Including \$100,000, deficiency act, Feb. 9, 1909.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Bureau of Entomology: Entomological investigations—								
1909.....	May 23, 1908	35	262	1	1909	\$148,800.00	\$146,280.85	\$2,519.15
1908 and 1909.....	.....do.....	35	262	1	1909	10,000.00	9,857.82	142.18
Preventing spread of moths, 1908 and 1909.....	.....do.....	35	268	1	1909	250,000.00	234,440.06	15,559.94
Bureau of Biological Survey: Biological investigations.....	.....do.....	35	262	1	1909	54,420.00	53,968.58	451.42
Division of Publications: Publications, Department of Agriculture ¹.....	.....do.....	35	263	1	1909	40,000.00	39,915.72	84.28
Bureau of Statistics: Collecting agricultural statistics.....	.....do.....	35	264	1	1909	125,000.00	122,402.81	2,597.19
Office of Experiment Stations: Agricultural experiment stations (\$1,371,000) ².....	.....do.....	35	265	1	1909	30,000.00	1,276,436.31	1,563.69
Farmers' Institutes.....	.....do.....	35	266	1	1909	10,000.00	9,655.91	344.09
Station at Alaska.....	.....do.....	35	266	1	1909	26,000.00	25,998.70	1.30
Station at Hawaii.....	.....do.....	35	266	1	1909	26,000.00	25,990.19	9.81
Station at Porto Rico.....	.....do.....	35	266	1	1909	26,000.00	26,000.00	.....
Station at Island of Guam.....	.....do.....	35	266	1	1909	5,000.00	4,971.45	28.55
Nutrition investigations.....	.....do.....	35	266	1	1909	7,000.00	6,995.03	4.97
Irrigation investigations.....	.....do.....	35	266	1	1909	150,000.00	149,588.32	411.68
Office of Public Roads: Public roads inquiries.....	.....do.....	35	267	1	1909	73,000.00	71,836.24	1,163.76
Rent and repairs.....	.....do.....	35	267	1	1909	2,000.00	2,000.00	.....
Weather Bureau: Salaries.....	.....do.....	35	252	1	1909	202,510.00	202,141.48	368.52
Fuel, lights, and repairs.....	.....do.....	35	252	1	1909	10,000.00	9,860.75	139.25
Contingent expenses.....	.....do.....	35	253	1	1909	11,000.00	10,721.27	278.73
Salaries, station employees.....	.....do.....	35	253	1	1909	586,750.00	586,265.12	484.88
General expenses.....	.....do.....	35	253	1	1909	852,000.00	831,764.20	20,235.80
Forest Service: General expenses.....	.....do.....	35	259	1	1909	3,151,900.00	3,134,455.63	17,444.37
Improvement of the national forests.....	.....do.....	35	260	1	1909	600,000.00	598,688.72	1,311.28

¹ Congress also appropriated in the sundry civil bill for printing and binding \$460,000.

² This includes \$720,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department. Congress also appropriated \$528,000 as a permanent appropriation for State experiment stations under the Adams bill, to be paid through the Treasury Department. Total to be paid through the Treasury Department for State experiment stations, \$1,248,000.

Cotton standardization.....	1045	2	1910	12,250	9,286.77	2,963.23
Grain standardization.....	35	1045	1910	52,440	42,904.39	9,535.61
Physical investigations.....	35	1045	1910	15,510	13,553.75	1,956.25
Special seeds and plants.....	35	1045	1910	11,550	9,251.06	2,298.94
Seed testing laboratories.....	35	1045	1910	25,840	24,480.56	1,359.44
Grain investigations.....	35	1045	2	63,910	64,830.00 AR	1,550.44
Tolacero investigations.....	35	1045	2	23,180	10,326.49	5,388.65
Cotton breeding.....	35	1045	2	18,130	15,387.83	3,853.51
General plant breeding.....	35	1045	2	14,840	11,173.51	3,666.49
Paper plant investigations.....	35	1045	2	10,000	7,692.31	2,307.69
Alkali and drought resistant plants.....	35	1045	2	17,550	15,886.54	1,663.46
Sugar plant investigations.....	35	1045	2	24,300	21,638.64	2,661.36
Taxonomic and range investigations.....	35	1045	2	18,250	16,906.11	1,343.89
Farmers' cooperative demonstration work.....	35	1045	2	133,000	103,984.13	29,015.87
Dry-land agriculture.....	35	1045	2	175,000	32,270.00 PQ	17,801.10
Western agricultural extension.....	35	1045	2	31,750	27,474.91	4,285.09
Pathological investigations.....	35	1045	2	70,680	68,181.74	8,498.26
Experimental gardens and grounds.....	35	1046	1910	71,300	59,536.34	13,259.66
Arkington farm and horticulture.....	35	1046	1910	19,220	21,030.00 D	493.10
Florida subtropical garden.....	35	1046	2	38,470	37,200.00 DP	4,330.84
South Texas garden.....	35	1046	2	5,100	4,058.04	1,041.96
Administrative and miscellaneous.....	35	1046	2	9,100	8,697.31	402.69
Purchase and distribution of valuable seeds.....	35	1047	2	48,976	48,856.00 R	5,864.51
Congressional seed distribution.....	35	1047	2	262,320	294,875.53	23,084.47
Forage crop investigations.....	35	1047	2	10,000	243,913.82	18,406.18
Foreign seed and plant introduction.....	35	1047	2	45,040	8,841.92	1,158.08
					42,119.79	3,520.21
BUREAU OF CHEMISTRY.						
General expenses, Bureau of Chemistry (deficiency act, Feb. 25, 1910, \$50,000).....	35	1049	2	1910	855,000.00	158,608.88
Laboratory.....	35	1049	2	1910	30,000	8,172.70
Laboratory transportation.....	35	1049	2	1910	6,300	3,000.43
Laboratory salaries and rent.....	35	1049	2	1910	70,240	64,494.37
Laboratory American food products.....	35	1049	2	1910	8,000	4,968.75
Food and drugs act, salaries in Washington.....	35	1049	2	1910	200,000	163,700.43
Food and drugs act, salaries out of Washington, (\$296,400).....	35	1049	2	1910	226,400	217,562.24
Food and drugs act, miscellaneous expenses (\$136,000).....	35	1049	2	1910	120,000	80,523.13
Deficiency act, miscellaneous expenses.....	35	1049	2	1910	27,000	706.96
Food and drugs act, transportation (\$86,000).....	35	1049	2	1910	81,000	55,045.04
Deficiency act, witness fees.....	35	1049	2	1910	23,000	2,959.33
Allocated to referee board:						
Food and drugs act, salaries out of Washington.....	35	1049	2	1910	40,000	46,868.75
Food and drugs act, miscellaneous expenses.....	35	1049	2	1910	16,000	15,034.94
Food and drugs act, transportation.....	35	1049	2	1910	4,000	1,492.31

And not to exceed 10 per cent of the foregoing amounts for the miscellaneous expenses of the work of any bureau, division or office herein provided for shall be available interchangeably for expense incurred on the objects included within the general expenses of such bureau, division, or office, but no more than 10 per cent shall be added to any one item of appropriation except in cases of extraordinary emergency, and then only upon the written order of the Secretary of Agriculture.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Subappropriations.	Transfer of funds.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.						
BUREAU OF SOILS.									
General expenses, Bureau of Soils.....	Mar. 4, 1909	35	1050	2	1910		\$197,360.00	\$159,755.77	\$7,604.23
Soil laboratory investigations.....	do.	35	1050	2	1910	\$48,500.00 J		48,185.46	314.56
Soil water investigations.....	do.	35	1050	2	1910	5,000		3,920.54	570.46
Soil survey.....	do.	35	1050	2	1910	137,360		131,163.12	6,196.88
Administrative expenses.....	do.	35	1050	2	1910	7,000		6,486.65	513.35
BUREAU OF ENTOMOLOGY.									
General expenses, Bureau of Entomology.....	do.	35	1050	2	1910		198,400.00	177,971.47	20,428.53
Deciduous fruit insects.....	do.	35	1050	2	1910	46,600		37,843.80	8,756.20
Cereal and forage insects.....	do.	35	1050	2	1910	21,000		20,309.54	2,140.46
Southern field crop insects.....	do.	35	1050	2	1910	42,000		37,983.38	4,016.62
Forest insects.....	do.	35	1050	2	1910	12,000		12,619.30	584.70
Truck crop and stored product insects.....	do.	35	1050	2	1910	16,250		15,031.28	1,218.72
Bee culture.....	do.	35	1050	2	1910	10,000		9,574.87	425.13
Citrus fruit insects.....	do.	35	1051	2	1910	16,500		14,359.48	2,140.52
Miscellaneous insects.....	do.	35	1051	2	1910	34,050		30,239.82	3,810.18
Preventing spread of moths, Bureau of Entomology.....	do.	35	1051	2	1910		300,000.00	246,361.94	53,638.06
BUREAU OF BIOLOGICAL SURVEY.									
General expenses, Bureau of Biological Survey.....	do.	35	1051	2	1910		74,420.00	63,440.01	10,970.90
Game preservation.....	do.	35	1051	2	1910	9,420		6,615.76	2,804.24
Maintenance of mammal and bird reservations.....	do.	35	1051	2	1910	7,000		5,293.68	1,706.32
Food habits of birds and mammals.....	do.	35	1051	2	1910	25,000		22,020.10	2,979.81
Biological investigations.....	do.	35	1051	2	1910	18,000		16,340.47	1,659.53
Administrative expenses.....	do.	35	1052	2	1910	15,000		12,981.43	2,018.57
DIVISION OF PUBLICATIONS.									
General expenses, Division of Publications ¹	do.	35	1053	2	1910		33,000.00	29,622.88	3,377.12
Rent in Washington.....	do.	35	1053	2	1910	5,000		4,583.33	416.67
Labor-saving machinery etc.....	do.	35	1053	2	1910	5,000		4,985.95	41.05
Stationery and materials.....	do.	35	1053	2	1910	11,500	12,500.00 M	11,349.21	1,150.79
Furniture and fixtures.....	do.	35	1053	2	1910	1,000		855.54	144.46
Photographic equipment.....	do.	35	1053	2	1910	5,000		4,659.61	340.39
Gas, electricity, etc.....	do.	35	1053	2	1910	1,500		982.87	537.13
Wagons, horses, etc.....	do.	35	1053	2	1910	1,000	1,075.00 S	987.28	87.72
Miscellaneous expenses.....	do.	35	1053	2	1910	3,000	1,935.00 MS	1,203.09	638.91

BUREAU OF STATISTICS.									
General expenses, Bureau of Statistics.....	35	1053	2	1910	25,800	23,300.00 K	117,000.00	100,440.51	16,619.49
Administrative expenses.....	35	1054	2	1910	56,000			18,840.65	4,319.35
Special field agents.....	35	1054	2	1910	30,200	32,700.00 K		49,051.64	6,948.36
State statisticians.....	35	1054	2	1910	2,500			28,430.29	4,200.74
Special investigations.....	35	1054	2	1910	2,500			1,839.48	660.52
Cost production farm products.....	35	1054	2	1910				2,278.46	221.55
OFFICE OF EXPERIMENT STATIONS.									
Agricultural experiment stations (\$83,800) 2.....	35	1055	2	1910	34,800		143,800.00	135,444.45	8,355.55
Agricultural experiment stations.....	35	1055	2	1910	10,000			33,310.79	1,480.21
Farmers' institutes.....	35	1055	2	1910	28,000			9,439.89	860.11
Station at Alaska.....	35	1055	2	1910	28,000			26,800.00	1,200.00
Station at Hawaii.....	35	1055	2	1910	28,000			28,000.00	
Station at Porto Rico.....	35	1055	2	1910	15,000			28,000.00	
Station at Island of Guam.....	35	1055	2	1910				9,893.97	5,106.03
Nutrition investigations.....	35	1056	2	1910			10,000.00	7,995.97	2,004.03
Irrigation investigations.....	35	1056	2	1910			75,000.00	68,375.74	6,624.26
Drainage investigations.....	35	1056	2	1910			81,100.00	70,958.93	10,201.07
OFFICE OF PUBLIC ROADS.									
General expenses, Office of Public Roads.....	35	1056	2	1910	18,000		100,000.00	80,186.49	19,813.51
Road management.....	35	1056	2	1910	34,000			16,487.05	1,512.95
Investigating road building and maintenance.....	35	1056	2	1910	25,000			20,336.79	4,663.21
Road material.....	35	1057	2	1910	23,000			19,173.00	5,827.00
Reports of investigations.....	35	1057	2	1910				15,189.65	7,810.35
Total for main department exclusive of Weather Bureau and Forest Service.....							9,156,988.11	8,158,560.05	998,428.06
WEATHER BUREAU.									
Salaries, Weather Bureau.....	35	1040	2	1910			205,310.00	204,560.91	740.09
Contingent expenses, Weather Bureau.....	35	1041	2	1910			25,000.00	22,776.08	2,223.92
General expenses, Weather Bureau.....	35	1041	2	1910			1,277,950.00	1,098,308.95	179,641.05
Station salaries.....	35	1041	2	1910	620,750			615,794.73	4,955.27
Miscellaneous expenses.....	35	1041	2	1910		91,500.00 O		71,386.10	20,113.90
Instruments, etc.....	35	1041	2	1910	30,000	31,900.00 LO		26,656.35	5,244.65
Rents and repairs.....	35	1041	2	1910	80,000	83,500.00 LL		63,395.65	20,104.35
Traveling expenses.....	35	1041	2	1910	22,000	20,000.00 L		17,671.20	2,328.80
Telephoning and telegraphing.....	35	1041	2	1910	200,000	269,000.00 HI		179,379.82	89,620.18
Line and cable repairs.....	35	1041	2	1910	4,200	3,800.00 H		2,753.82	1,046.18
Investigations and substations.....	35	1041	2	1910	125,000	112,500.00 IO		78,182.46	34,317.54
Printing office.....	35	1041	2	1910	45,000			43,089.82	1,910.18
Total for Weather Bureau.....							1,508,240.00	1,325,645.94	182,614.06

¹ Congress also appropriated in the sundry civil bill for printing and binding, \$460,000.

² This includes \$21,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department. Congress also appropriated \$924,000 as permanent appropriation for State experiment stations under the Adams bill to be paid through the Treasury Department. Total to be paid through the Treasury Department for State experiment stations, \$1,344,000.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Subappropriations.	Transfer of funds.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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FOREST SERVICE.									
Salaries, Forest Service.....	Mar. 4, 1909	35	1047	2	1910		\$50,290.00	\$59,455.60	\$744.10
General expenses, Forest Service.....	do.....	35	1047	2	1910		3,985,000.00	3,375,394.21	410,605.79
Improvement of the national forests.....	do.....	35	1048	2	1910		600,000.00	537,101.27	62,898.73
National bison range (appropriated \$43,000), balance available July 1, 1909 (deficiency act Feb. 25 1910, \$7,700).....	May 23, 1908 Mar. 4, 1909	35	267 927	1 1	1909 1909		50,480.40 42,780.40	47,301.22	3,089.18
Naval stores industry (\$10,000), balance available July 1, 1909.....		35	267	1	1909		1,050.68	1,046.13	4.55
Total for (regular) Forest Service.....							4,697,731.08	4,220,388.73	477,342.35
Total of all regular and special appropriations for entire department.....							15,362,979.19	13,704,504.72	1,658,384.47
Refunds to deposits, excess of depositors.....							59,089.37	48,995.86	10,722.61
Cooperative work, forest investigations.....							47,965.40	40,670.39	7,295.21
Grand total.....							15,470,034.16	13,794,231.97	1,676,402.19
Salaries, Forest Service (included in main caption).....	May 26, 1910	36	424	1	1911		60,200.00	56,599.49	3,600.51
Improvement of the national forests.....	do.....	36	431	1	1911		275,000.00	243,225.06	31,774.94
General expenses, Forest Service.....	do.....	36	430	1	1911		5,572,900.00	5,027,705.50	545,194.50
Fighting forest fires.....	do.....	36	430	1	1911		\$135,000.00	1,065,081.70	27,968.30
Maintenance and supplies.....	do.....	36	430	1	1911		221,040.00	182,808.00	71,233.47
Forest products.....	do.....	36	430	1	1911		120,420.00	118,686.89	10,734.11
National forest range investigations.....	do.....	36	430	1	1911		11,820.00	9,063.28	2,756.72
Silviculture, national forests.....	do.....	36	430	1	1911		60,640.00	56,313.74	3,901.94
Management of forests.....	do.....	36	430	1	1911		108,010.00	82,417.82	11,333.08
Market and miscellaneous investigations.....	do.....	36	430	1	1911		115,470.00	104,804.85	10,376.55
Paper tests.....	do.....	36	430	1	1911		14,000.00	11,091.80	2,908.20
Abasco National Forest.....	do.....	36	425	1	1911		20,844.00	16,504.02	1,714.33
Alamo National Forest.....	do.....	36	425	1	1911		33,449.00	19,214.29	1,562.31
Angeles National Forest.....	do.....	36	425	1	1911		50,644.00	50,145.06	5,562.34
Arroyo National Forest.....	do.....	36	425	1	1911		31,414.00	28,080.07	3,164.91
Arapahoe National Forest.....	do.....	36	425	1	1911		21,560.00	19,995.00	1,721.12
Arkansas National Forest.....	do.....	36	425	1	1911		32,960.00	31,735.32	1,066.74
Ashley National Forest.....	do.....	36	425	1	1911		19,668.00	13,581.64	1,698.78
Battlement National Forest.....	do.....	36	425	1	1911		15,700.00	11,881.61	1,700.03
Beartooth National Forest.....	do.....	36	425	1	1911		17,290.00	15,314.00	1,352.90
Beartooth National Forest.....	do.....	36	425	1	1911		17,290.00	16,366.35	1,390.09

Beaverhead National Forest.....do.....	36	425	1911	31,837	21,314.44	18,913.01	2,401.43
Bighorn National Forest.....do.....	36	425	1911	32,238	28,087.13	24,861.32	3,225.81
Bitterroot National Forest.....do.....	36	425	1911	31,391	28,447.04	26,996.06	2,510.98
Blackfoot National Forest.....do.....	36	425	1911	38,159	20,335.86	18,001.46	2,334.40
Black Hills National Forest.....do.....	36	425	1911	44,746	50,904.16	44,424.68	6,479.51
Boise National Forest.....do.....	36	425	1911	27,925	22,269.12	21,027.45	2,041.67
Bonneville National Forest.....do.....	36	425	1911	22,822	22,789.56	20,349.61	2,439.95
Cabinet National Forest.....do.....	36	425	1911	21,143	16,642.60	15,312.05	1,330.55
Cache National Forest.....do.....	36	425	1911	18,700	17,590.85	15,403.00	2,187.85
California National Forest.....do.....	36	425	1911	26,240	26,316.22	21,723.99	4,592.23
Caribou National Forest.....do.....	36	425	1911	20,200	15,567.10	13,502.84	2,064.26
Carson National Forest.....do.....	36	426	1911	28,971	22,127.91	18,556.86	3,571.05
Cascade National Forest.....do.....	36	426	1911	37,280	26,437.66	23,500.47	2,937.19
Challis National Forest.....do.....	36	426	1911	21,600	13,311.00	11,491.90	1,819.10
Chelan National Forest.....do.....	36	426	1911	59,195	40,173.05	35,368.78	4,804.27
Chiricahua National Forest.....do.....	36	426	1911	21,131	15,541.00	13,277.56	2,263.44
Choctawhatchee National Forest.....do.....	36	426	1911	9,001	9,909.00	8,871.71	1,037.29
Chugach National Forest.....do.....	36	426	1911	17,848	18,048.00	15,393.35	2,654.65
Clearwater National Forest.....do.....	36	426	1911	41,108	33,202.28	32,770.69	2,431.59
Cleveland National Forest.....do.....	36	426	1911	38,783	38,483.00	30,824.63	7,658.37
Coechetopa National Forest.....do.....	36	426	1911	17,704	16,146.13	14,674.00	1,471.47
Coeur d'Alene National Forest.....do.....	36	426	1911	50,226	41,358.77	37,240.10	4,118.67
Coeur d'Alene National Forest.....do.....	36	426	1911	45,976	46,511.02	43,734.88	2,776.14
Colorado National Forest.....do.....	36	426	1911	19,854	21,046.00	18,969.00	2,077.00
Columbia National Forest.....do.....	36	426	1911	23,376	22,875.20	20,853.57	2,021.63
Colville National Forest.....do.....	36	426	1911	22,910	22,679.50	20,218.00	2,461.50
Crater National Forest.....do.....	36	426	1911	24,212	14,121.45	12,998.56	1,122.89
Crater National Forest.....do.....	36	426	1911	31,369	35,505.90	32,383.41	3,122.49
Crook National Forest.....do.....	36	426	1911	27,712	20,034.00	18,689.74	1,344.26
Custer National Forest.....do.....	36	426	1911	12,847	14,032.48	12,258.63	1,773.85
Dadil National Forest.....do.....	36	426	1911	42,903	33,720.77	29,571.57	4,149.20
Deerlodge National Forest.....do.....	36	426	1911	41,208	41,519.62	36,564.42	4,955.20
Deschutes National Forest.....do.....	36	426	1911	30,463	31,270.15	27,399.21	3,870.94
Dixie National Forest.....do.....	36	426	1911	16,600	13,501.00	12,569.97	931.03
El Dorado National Forest.....do.....	36	426	1911	11,350	12,485.00	10,924.19	1,560.81
Elmore National Forest.....do.....	36	426	1911	18,730	16,310.00	14,449.39	1,860.61
Fishlake National Forest.....do.....	36	426	1911	20,800	14,849.15	13,678.38	1,170.77
Flathead National Forest.....do.....	36	426	1911	35,850	37,825.68	36,181.72	1,643.96
Fremont National Forest.....do.....	36	426	1911	29,900	25,181.55	22,990.07	2,191.48
Gallatin National Forest.....do.....	36	426	1911	26,594	18,520.27	16,638.81	1,881.46
Garces National Forest.....do.....	36	426	1911	19,345	11,393.83	9,785.70	1,608.13
Gila National Forest.....do.....	36	427	1911	16,345	18,947.09	16,084.49	2,862.60
Gunnison National Forest.....do.....	36	427	1911	20,586	18,523.64	16,546.85	1,976.79
Hayden National Forest.....do.....	36	427	1911	16,850	15,004.03	13,546.80	1,488.23
Helena National Forest.....do.....	36	427	1911	34,508	33,422.46	28,933.66	4,488.80
Holy Cross National Forest.....do.....	36	427	1911	18,610	17,115.84	15,527.25	1,588.59
Humboldt National Forest.....do.....	36	427	1911	19,025	20,276.00	17,931.75	2,344.25
Idaho National Forest.....do.....	36	427	1911	21,780	15,116.65	13,370.55	1,746.10
Inyo National Forest.....do.....	36	427	1911	29,500	22,540.00	19,752.79	2,787.21
Jefferson National Forest.....do.....	36	427	1911	34,001	27,290.98	25,216.53	2,074.45
Jemez National Forest.....do.....	36	427	1911	31,476	20,186.98	17,905.32	2,281.66
Kabab National Forest.....do.....	36	427	1911	20,400	16,641.78	15,365.43	1,276.35

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Subappropriations.	Transfer of funds.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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FOREST SERVICE—continued.									
General expenses, Forest Service—Continued.									
Kaniku National Forest.....	May 26, 1910	36	427	1 1911	\$28,448	\$31,204.50	\$27,923.70	\$3,280.80
Kansas National Forest.....	do.....	36	427	1 1911	8,805	7,452.00	.....	6,305.52	1,126.48
Kern National Forest.....	do.....	36	427	1 1911	27,512	26,631.13	.....	23,844.39	2,786.74
Klamath National Forest.....	do.....	36	427	1 1911	42,000	31,272.18	.....	27,310.79	3,961.39
Kootenai National Forest.....	do.....	36	427	1 1911	30,634	32,080.80	.....	28,897.83	3,242.97
La Sal National Forest.....	do.....	36	427	1 1911	13,890	12,934.81	.....	11,413.56	1,521.25
Lassen National Forest.....	do.....	36	427	1 1911	31,154	22,322.00	.....	19,024.08	3,297.92
Leadville National Forest.....	do.....	36	427	1 1911	29,720	22,384.00	.....	20,314.43	2,069.57
Lemhi National Forest.....	do.....	36	427	1 1911	20,750	17,096.27	.....	14,534.32	2,561.65
Lewis and Clark National Forest.....	do.....	36	427	1 1911	17,426	15,498.08	.....	14,590.79	2,697.29
Lincoln National Forest.....	do.....	36	427	1 1911	20,218	13,915.00	.....	12,513.51	1,401.49
Lolo National Forest.....	do.....	36	427	1 1911	28,952	31,562.54	.....	28,399.60	3,102.94
Madison National Forest.....	do.....	36	427	1 1911	24,743	22,827.00	.....	20,683.79	2,143.21
Malheur National Forest.....	do.....	36	427	1 1911	23,063	18,547.80	.....	16,488.08	2,069.72
Manti National Forest.....	do.....	36	427	1 1911	23,000	20,581.33	.....	18,759.39	1,821.94
Manzano National Forest.....	do.....	36	427	1 1911	14,776	10,080.00	.....	9,570.37	1,110.23
Marquette National Forest.....	do.....	36	427	1 1911	2,405	1,945.28	.....	1,268.84	676.84
Medicine Bow National Forest.....	do.....	36	427	1 1911	28,350	23,709.31	.....	21,474.02	2,385.29
Michigan National Forest.....	do.....	36	427	1 1911	3,744	3,825.00	.....	3,290.83	604.17
Minnesota National Forest.....	do.....	36	427	1 1911	24,433	19,521.70	.....	17,806.40	1,625.30
Minidoka National Forest.....	do.....	36	428	1 1911	17,800	13,908.00	.....	11,990.94	1,908.06
Missoula National Forest.....	do.....	36	428	1 1911	34,504	24,599.39	.....	21,600.27	2,000.12
Moapa National Forest.....	do.....	36	428	1 1911	3,400	2,886.25	.....	2,486.13	480.12
Modoc National Forest.....	do.....	36	428	1 1911	30,800	22,155.40	.....	19,888.16	2,267.24
Mono National Forest.....	do.....	36	428	1 1911	23,725	20,778.19	.....	16,738.81	4,039.38
Monterey National Forest.....	do.....	36	428	1 1911	15,070	8,370.00	.....	6,393.22	1,976.78
Montezuma National Forest.....	do.....	36	428	1 1911	23,440	19,365.42	.....	17,813.03	1,552.39
Nebo National Forest.....	do.....	36	428	1 1911	9,300	8,300.15	.....	7,602.70	737.45
Nevada National Forest.....	do.....	36	428	1 1911	18,250	13,987.50	.....	12,954.44	1,033.06
Nevada National Forest.....	do.....	36	428	1 1911	20,900	18,105.00	.....	16,129.69	2,005.31
Nezperce National Forest.....	do.....	36	428	1 1911	28,507	22,032.00	.....	20,217.65	1,814.35
Ocala National Forest.....	do.....	36	428	1 1911	5,623	5,823.00	.....	4,652.00	1,171.00
Olympic National Forest.....	do.....	36	428	1 1911	32,925	32,628.12	.....	30,157.39	2,590.33
Oregon National Forest.....	do.....	36	428	1 1911	40,852	36,889.42	.....	31,474.88	5,414.54
Ozark National Forest.....	do.....	36	428	1 1911	26,901	26,825.06	.....	24,990.53	1,834.53
Paisdale National Forest.....	do.....	36	428	1 1911	15,550	16,705.00	.....	14,987.12	2,117.88
Payette National Forest.....	do.....	36	428	1 1911	20,640	20,722.00	.....	18,493.68	2,288.32
Pecos National Forest.....	do.....	36	428	1 1911	20,489	20,937.90	.....	27,367.35	2,570.55
Pend d'Oreille National Forest.....	do.....	36	428	1 1911	27,162	28,155.90	.....	26,784.63	1,370.97

Pike National Forest.....	36	428	1	1911	41,280	41,394.83	38,234.75	3,165.08
Phumas National Forest.....	36	428	1	1911	42,012	38,307.00	32,967.52	5,339.48
Pocahontas National Forest.....	36	428	1	1911	20,246	15,582.95	14,544.70	1,038.25
Powell National Forest.....	36	428	1	1911	16,500	11,630.00	10,150.96	1,479.04
Prescott National Forest.....	36	428	1	1911	33,851	22,983.23	21,311.46	1,671.78
Rainier National Forest.....	36	428	1	1911	36,220	24,462.44	22,079.05	2,383.39
Rio Grande National Forest.....	36	428	1	1911	26,620	27,190.61	25,257.54	1,933.07
Routt National Forest.....	36	428	1	1911	22,050	22,290.45	20,967.73	1,321.72
Salmon National Forest.....	36	428	1	1911	29,825	31,090.67	28,531.16	2,559.51
San Isabel National Forest.....	36	428	1	1911	18,070	17,084.89	15,284.61	1,790.28
San Juan National Forest.....	36	428	1	1911	31,458	28,683.34	25,837.06	2,846.28
Santa Barbara National Forest.....	36	428	1	1911	37,889	41,677.00	34,471.95	7,205.05
Sawtooth National Forest.....	36	428	1	1911	27,900	17,423.43	15,035.35	2,388.08
Sequoia National Forest.....	36	428	1	1911	31,512	25,412.00	20,011.10	5,400.90
Sevier National Forest.....	36	428	1	1911	20,350	17,476.06	15,804.97	1,671.09
Shasta National Forest.....	36	428	1	1911	38,675	39,952.22	35,844.50	4,107.06
Shoshone National Forest.....	36	428	1	1911	25,220	18,647.98	16,363.53	2,284.45
Sierra National Forest.....	36	428	1	1911	49,370	44,105.03	37,037.13	6,407.90
Sioux National Forest.....	36	428	1	1911	10,919	11,818.68	10,271.43	1,547.25
Siskiyou National Forest.....	36	428	1	1911	29,561	21,107.41	18,939.95	2,167.46
Sitgreaves National Forest.....	36	428	1	1911	28,074	22,776.00	19,407.02	3,368.98
Siuslaw National Forest.....	36	428	1	1911	23,175	19,481.80	18,002.57	1,479.23
Snoqualmie National Forest.....	36	428	1	1911	30,129	28,851.24	25,462.24	3,389.00
Sopris National Forest.....	36	428	1	1911	22,053	18,327.82	16,783.23	1,544.54
Stanislaus National Forest.....	36	428	1	1911	35,788	34,012.81	30,406.23	3,606.53
Stander National Forest.....	36	428	1	1911	6,029	5,790.00	5,110.96	679.04
Superior National Forest.....	36	428	1	1911	19,379	15,276.00	12,979.52	2,296.48
Tahoe National Forest.....	36	428	1	1911	30,886	32,972.22	29,391.21	3,581.01
Targhee National Forest.....	36	428	1	1911	16,850	20,220.00	18,556.31	1,663.69
Teton National Forest.....	36	428	1	1911	22,100	11,570.67	10,399.04	1,171.63
Toiyabe National Forest.....	36	428	1	1911	24,000	13,960.00	12,607.03	1,352.97
Tongass National Forest.....	36	428	1	1911	8,300	3,530.00	8,347.54	1,182.46
Tonto National Forest.....	36	428	1	1911	33,111	18,200.00	16,500.49	1,699.51
Trinity National Forest.....	36	428	1	1911	36,000	31,333.60	28,804.10	2,529.50
Tusayan National Forest.....	36	428	1	1911	27,214	26,939.60	23,826.43	3,113.17
Uinta National Forest.....	36	428	1	1911	28,600	23,657.93	21,372.24	2,285.69
Unatilla National Forest.....	36	428	1	1911	17,200	15,574.38	12,974.04	2,600.34
Uncompahgre National Forest.....	36	428	1	1911	36,110	31,057.41	26,194.78	4,862.63
Wallowa National Forest.....	36	428	1	1911	25,990	20,831.67	19,218.30	1,613.37
Washington National Forest.....	36	428	1	1911	33,300	26,083.49	23,189.75	2,893.74
Weiser National Forest.....	36	428	1	1911	23,450	15,806.69	14,197.90	1,608.79
Wenatchee National Forest.....	36	428	1	1911	31,925	22,866.99	19,951.13	2,915.86
White River National Forest.....	36	430	1	1911	22,800	18,818.00	16,632.53	2,185.42
Whitman National Forest.....	36	430	1	1911	19,790	16,055.00	13,133.30	2,921.70
Wichita National Forest.....	36	430	1	1911	32,129	22,833.04	20,811.73	2,021.31
Wyoming National Forest.....	36	430	1	1911	26,950	20,280.69	18,536.53	1,744.16
Zuni National Forest.....	36	430	1	1911	10,650	5,860.00	22,073.64	2,800.34
General Administration, 10 per cent.....	36	430	1	1911	19,700	17,505.00	5,100.90	2,400.10
					19,741	11,240.71	9,096.64	2,144.07
							436,413.46	38,848.14
						\$472,201.00		

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appro- priation act.	Reference to Statutes at Large.			Fiscal year.	Subappro- priations.	Transfer of funds.	Amount ap- propriated.	Amount dis- bursed.	Amount un- expended.
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SPECIAL APPROPRIATIONS.										
Paper tests, 1911 (sundry civil bill, June 25, 1910).	June 25, 1910	36	753	1	1911			\$30,000.00	\$26,485.40	\$3,514.60
Refunds to depositors, excess of deposits.								65,630.78	57,912.73	7,718.05
Cooperative work, forest investigations.								14,915.59	10,937.88	3,977.71
National Bison Range.	(May 23, 1908	35	267	1	}					
Mar. 4, 1909	35	927	1							
May 23, 1908	35	267	1							
Naval stores industry.	Mar. 4, 1911	36	1252	1				3,089.18	2,381.61	707.57
General expenses, Forest Service, 1911-12.								70,000.00	4.55	70,000.00
Total for Forest Service.								6,091,740.10	5,425,372.67	666,367.43
Salaries, Department of Agriculture (not in- cluding Weather Bureau).	May 26, 1910	36	416	1	1911			1,267,500.00	1,193,069.54	74,430.46
Officers and clerks.	do.	36	416, 417	1	1911	\$1,259,900			1,186,090.73	73,809.27
Extra labor.	do.	36	417	1	1911	7,600			6,978.81	621.19
Contingent expenses, Department of Agriculture	do.	36	437	1	1911			100,000.00	85,792.44	14,207.56
Library, Department of Agriculture.	do.	36	437	1	1911			15,400.00	10,904.86	4,495.14
Enforcement of the insecticide act.	do.	36	1312	1	1911			35,000.00	6,237.48	28,762.52
National Forest Reservation Commission.	Mar. 4, 1911	36	963	14	1911			25,000.00	4.00	24,996.00
Acquisition of lands for protection of watersheds of navigable streams (appropriated \$2,000,000; but \$25,000 in use at time of statement).	do.	36	961	3	1911			25,000.00	9,964.17	15,035.83
Cooperative fire protection of forested water- sheds of navigable streams.	do.	36	961	2				200,000.00		200,000.00
BUREAU OF ANIMAL INDUSTRY.										
General expenses, Bureau of Animal Industry.	May 26, 1910	36	419, 420	1	1911			1,234,540.00	1,043,876.50	190,663.50
Inspection and quarantine.	do.	36	420	1	1911	623,000	\$615,800.00 J		527,028.39	88,771.61
Eradicating cattle ticks.	do.	36	420	1	1911	250,000	243,800.00 W ¹ J ¹		201,511.10	42,288.90
Dairy industry.	do.	36	420	1	1911	147,000	154,600.00 J ¹		132,091.03	21,008.97
Animal husbandry.	do.	36	420	1	1911	42,000	46,200.00 J ¹ W		38,510.78	7,689.22
Diseases of animals.	do.	36	420	1	1911	108,000			92,732.17	15,267.83
Experimental farm.	do.	36	420	1	1911	12,000	13,200.00 J		3,346.88	9,853.12
Administrative expenses.	do.	36	420	1	1911	51,940	52,940.00 J ¹		48,056.15	4,883.85
Cooperative experiments in animal feeding and breeding.	do.	36	420	1	1911			50,000.00	45,946.39	4,053.61
Meat inspection, Bureau of Animal Industry (permanent appropriation).	June 30, 1906	34	674	1	1911			3,000,000.00	2,601,418.96	398,581.04
General expenses, Bureau of Animal Industry, 1911-1912.	Mar. 4, 1911	36	1240	1				65,000.00	10.85	64,989.15

BUREAU OF PLANT INDUSTRY.									
General expenses, Bureau of Plant Industry, 1910-11.....	May 26, 1910	36	422	1	1911	10,000.00	8,800.72	1,199.28	
General expenses, Bureau of Plant Industry, 1911.....	do.	36	421-423	1	1911	1,013,756.77	1,013,756.77	169,589.23	
Pathological laboratory.....	do.	36	421	1	1911	19,669.46	19,669.46	1,340.54	
Fruit diseases.....	do.	36	421	1	1911	28,936.27	28,936.27	4,738.73	
Forest pathology.....	do.	36	421	1	1911	33,675.00 R	33,675.00 R	4,738.73	
Cotton and truck diseases.....	do.	36	421	1	1911	16,510	14,886.74	1,423.26	
Crop physiology.....	do.	36	421	1	1911	12,960	11,289.91	2,070.09	
Bacteriology and nutrition.....	do.	36	421	1	1911	25,016	23,018.43	1,996.57	
Crop acclimatization.....	do.	36	421	1	1911	23,728	20,634.21	3,093.79	
Drug and other plants.....	do.	36	421	1	1911	34,970	30,859.82	3,810.18	
Crop technology.....	do.	36	422	1	1911	42,970	38,995.48	3,874.52	
Cotton standardization.....	do.	36	422	1	1911	13,030	14,330.00 NTZA ¹	2,458.20	
Grain standardization.....	do.	36	422	1	1911	36,650	34,600.00 KSTZA ¹ K ¹	10,122.48	
Physical investigations.....	do.	36	422	1	1911	51,020	50,520.00 G ¹	10,690.19	
Special seeds and plants.....	do.	36	422	1	1911	15,255	12,691.96	2,563.04	
Seed testing laboratories.....	do.	36	422	1	1911	16,650	14,145.57	2,504.43	
Grain investigations.....	do.	36	422	1	1911	25,830	22,741.37	3,088.63	
Tobacco investigations.....	do.	36	422	1	1911	61,925	54,511.32	8,163.68	
General plant breeding.....	do.	36	422	1	1911	22,330	18,174.49	3,635.51	
Paper plant investigations.....	do.	36	422	1	1911	8,775	10,438.34	3,241.66	
Alkali and drought resistant plants.....	do.	36	422	1	1911	17,500	8,507.72	1,097.28	
Sugar plant investigations.....	do.	36	422	1	1911	23,075	13,045.78	4,454.22	
Taxonomic and range investigations.....	do.	36	422	1	1911	17,650	18,212.59	4,802.41	
Farm management.....	do.	36	422	1	1911	130,060	15,270.15	2,379.85	
Farmers' cooperative demonstration work.....	do.	36	422	1	1911	240,155	114,025.27	16,484.73	
Dry land agriculture.....	do.	36	422	1	1911	31,730	202,637.31	30,833.69	
Western agricultural extension.....	do.	36	422	1	1911	71,615	26,884.15	4,845.85	
Experimental gardens and grounds.....	do.	36	422	1	1911	13,540	66,825.30	7,554.70	
Arlington farm and horticulture.....	do.	36	423	1	1911	34,930	60,392.87	11,386.13	
South Texas garden.....	do.	36	423	1	1911	9,100	13,752.47	1,141.53	
Administrative and miscellaneous.....	do.	36	423	1	1911	41,007.00 FGQ	31,512.51	5,117.49	
Purchase and distribution of valuable seeds.....	do.	36	423, 424	1	1911	265,710	8,908.97	101.03	
Congressional seed distribution.....	do.	36	423, 424	1	1911	43,880	36,560.18	4,437.82	
Foreign seed and plant introduction.....	do.	36	423, 424	1	1911	309,590.00	279,281.61	30,308.39	
Investigating the chestnut tree bark disease, 1911-1912.....	Mar. 4, 1911	36	1264	1	1911	5,000.00	239,844.97	25,805.03	
							39,436.64	4,445.30	
							812.31	4,157.69	
BUREAU OF CHEMISTRY.									
General expenses, Bureau of Chemistry.....	May 26, 1910	36	431, 432	1	1911	816,340.00	657,766.56	158,573.44	
Laboratory, miscellaneous expenses.....	do.	36	431	1	1911	36,000	22,969.51	13,030.49	
Laboratory, salaries and rent.....	do.	36	431	1	1911	66,467.97	66,467.97	6,532.03	
Laboratory, American food products.....	do.	36	431	1	1911	4,523.24	4,523.24	476.76	
Food and drugs eaten in Washington.....	do.	36	432	1	1911	175,000	165,134.56	9,865.44	
Food and drugs eaten out of Washing- ton (\$287,340).....	do.	36	432	1	1911	232,340	221,684.85	25,655.15	

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appro- priation act.	Reference to Statutes at Large.		Fiscal year.	Subappro- priations.	Transfer of funds.	Amount ap- propriated.	Amount dis- bursed.	Amount un- expended.
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BUREAU OF CHEMISTRY—continued.									
General expenses, Bureau of Chemistry—Con. Food and drugs act, miscellaneous expenses (\$240,000).	May 26, 1910	36	432	1	1911	\$205,000.00 A		\$126,901.70	\$78,098.30
Allotted to Reference Board: Food and drugs act, salaries out of Wash- ington.....	do.	36	432	1	1911	53,500.00 H ¹		30,153.40	23,346.60
Food and drugs act, miscellaneous ex- penses.....	do.	36	432	1	1911	20,000		19,931.33	1,568.67
BUREAU OF SOILS.									
General expenses, Bureau of Soils.....	May 26, 1910	36	432	1	1911		\$193,600.00	173,113.17	20,486.83
Soil laboratory investigations.....	do.	36	432	1	1911	48,000		44,477.86	3,647.14
Soil water investigations.....	do.	36	432	1	1911	5,000		4,136.08	538.32
Soil survey.....	do.	36	432	1	1911	135,100		120,488.00	14,702.00
Administrative expenses.....	do.	36	432	1	1911	5,440		4,040.03	1,599.37
General expenses, Bureau of Soils, 1911-1912.....	Mar. 4, 1911	36	1256	1			2,500.00	1,844.87	655.13
BUREAU OF ENTOMOLOGY.									
General expenses, Bureau of Entomology.....	May 26, 1910	36	433	1	1911		202,900.00	178,079.81	24,820.19
Deciduous fruit insects.....	do.	36	433	1	1911	40,000		34,156.47	5,843.53
Cereal and forage insects.....	do.	36	433	1	1911	25,000		22,844.53	2,155.47
Southern field crop insects.....	do.	36	433	1	1911	47,000		41,191.05	5,808.35
Forest insects.....	do.	36	433	1	1911	14,000	15,400.00 B	14,149.23	1,250.77
Truck-crop and stored-product insects.....	do.	36	433	1	1911	16,250	17,875.00 H	15,562.34	2,312.60
Bee culture.....	do.	36	433	1	1911	10,000		9,386.41	613.59
Citrus fruit insects.....	do.	36	433	1	1911	16,500	14,875.00 H	11,161.05	3,713.95
White fly investigations.....	do.	36	433	1	1911	6,000		4,753.10	246.90
Miscellaneous insects.....	do.	36	433	1	1911	28,650		24,875.03	2,274.97
Preventing spread of moths, Bureau of Entomology.....	do.	36	334	1	1911		300,000.00	285,046.84	14,953.16
General expenses, Bureau of Entomology 1911-12.....	Mar. 4, 1911	36	1,257	1			10,000.00	4,789.58	5,210.42
BUREAU OF BIOLOGICAL SURVEY.									
General expenses, Bureau of Biological Survey.....	May 26, 1910	36	434	1	1911		71,520.00	59,114.01	12,405.99
Game preservation.....	do.	36	434	1	1911	9,420		6,619.37	2,800.63

Maintenance of mammal and bird reservations.....	36	434	1	1911	7,000			5,048.00	1,951.91
Food habits of birds and mammals.....	36	434	1	1911	25,000			20,944.82	4,055.18
Biological investigations.....	36	434	1	1911	18,000			16,544.82	1,555.18
Administrative expenses.....	36	433	1	1911	12,100	18,100.00 B ¹		9,906.91	2,043.09
Protection and removal of elk in Wyoming.....	36	1,298	1			12,600.00 B ¹	20,000.00	995.38	19,004.62
DIVISION OF PUBLICATIONS.									
General expenses, Division of Publications ¹	36	435, 436	1	1911			30,000.00	22,131.47	7,868.53
Rent in Washington.....	36	435	1	1911	5,000			4,583.33	416.67
Labor-saving machinery, etc.....	36	435	1	1911	11,500			2,197.15	802.85
Stationery and materials.....	36	435	1	1911	1,000			7,672.42	3,827.58
Furniture and fixtures.....	36	436	1	1911	4,000			608.41	391.59
Photographic equipment.....	36	436	1	1911	1,500			3,839.46	160.54
Gas, electricity, etc.....	36	436	1	1911	1,000			699.48	800.52
Wagons, horses, etc.....	36	436	1	1911	1,000			165.69	833.31
Miscellaneous expenses.....	36	436	1	1911	3,000			2,364.53	635.47
BUREAU OF STATISTICS.									
General expenses, Bureau of statistics.....	36	436	1	1911			115,020.00	91,344.10	24,275.90
Administrative expenses.....	36	436	1	1911	24,920	24,119.25 LO		20,110.90	4,008.35
Special field agents.....	36	436	1	1911	56,000	53,600.75 CP		44,579.82	9,020.93
State statistical agents.....	36	436	1	1911	30,200	33,200.00 COP		22,740.47	10,450.53
Special investigations.....	36	436	1	1911	2,000	2,200.00 L		1,622.71	577.29
Cost production farm products.....	36	436	1	1911	2,500			2,281.20	218.80
OFFICE OF EXPERIMENT STATIONS.									
Agricultural experiment stations (\$862,400 ²).....	36	437, 438		1911			142,400.00	125,816.74	16,583.26
Agricultural experiment stations.....	36	438	1	1911	33,400			30,533.97	2,866.03
Farmers' Institutes.....	36	438	1	1911	10,000			8,094.93	1,905.07
Station at Alaska.....	36	438	1	1911	28,000			28,000.00	
Station at Hawaii.....	36	438	1	1911	28,000			28,000.00	
Station at Porto Rico (including \$5,000 for coffee investigations).....	36	438	1	1911	28,000			28,000.00	
Station at island of Guam.....	36	438	1	1911	15,000			13,732.38	1,267.62
Nutrition investigations.....	36	438	1	1911			10,000.00	9,358.07	461.93
Irrigation investigations.....	36	438	1	1911			70,380.00	69,072.08	1,307.32
Drainage investigations.....	36	439	1	1911			78,860.00	69,178.66	9,681.34

¹ Congress also appropriated in the sundry civil bill for printing and binding, \$460,000.

² This includes \$720,000 for State experiment stations under the regular appropriation, to be paid through the Treasury Department. Congress also appropriated \$720,000 as a permanent appropriation for State experiment stations under the Adams bill, to be paid through the Treasury Department. Total to be paid through the Treasury Department for State experiment stations, \$1,440,000.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appro- priation act	Reference to Statutes at Large.			Fiscal year.	Subappro- priations.	Transfer of funds.	Amount ap- propriated.	Amount dis- bursed.	Amount un- expended.
		Vol.	Page.	Sec.						
OFFICE OF PUBLIC ROADS.										
General expenses, Office of Public Roads.....	May 26, 1910	36	439	1	1911			\$92,980.00	\$81,815.52	\$11,164.48
Road management.....	do	36	439	1	1911	\$16,000			14,497.19	1,592.81
Investigating road building and main- tenance.....	do	36	439	1	1911	43,000			36,803.56	6,196.44
Road material.....	do	36	439	1	1911	23,280	\$22,400.00 C'E		21,184.69	1,215.31
Administrative expenses.....	do	36	439	1	1911	10,760	11,586.00 C'E		9,390.08	2,189.92
Total for main department, exclusive of Weather Bureau and Forest Service.....								9,682,476.00	8,129,524.06	1,552,951.94
WEATHER BUREAU										
Salaries, Weather Bureau.....	May 26, 1910	36	417	1	1911			199,427.50	190,870.53	8,556.97
Contingent expenses, Weather Bureau.....	do	36	418	1	1911			25,000.00	21,131.98	3,868.02
General expenses, Weather Bureau.....	do	36	418, 419	1	1911			1,280,332.50	982,392.84	287,939.65
Station salaries.....	do	36	418	1	1911	630,410			568,082.53	62,327.47
Miscellaneous expenses.....	do	36	418	1	1911	94,000	99,000.00 M		79,975.05	19,070.95
Instruments, etc.....	do	36	418	1	1911	30,000	33,000.00 M		24,912.42	8,087.38
Sand Key building.....	do	36	418	1	1911	15,000			14,465.90	14,465.90
Rents and repairs.....	do	36	418	1	1911	82,500	84,000.00 M		63,676.58	20,333.42
Traveling expenses.....	do	36	418	1	1911	22,000	20,500.00 X		16,613.52	3,886.48
Telephoning and telegraphing.....	do	36	418	1	1911	265,700	268,700.00 M X		137,507.80	131,192.20
Line and cable repairs.....	do	36	418	1	1911	4,000			995.99	3,004.01
Investigations and substations.....	do	36	418	1	1911	120,000	108,000.00 M		74,466.15	33,533.85
Printing office.....	do	36	418	1	1911	40,000	26,722.50		25,634.60	2,067.90
Total for Weather Bureau.....								1,504,760.00	1,204,395.35	300,364.65
Grand total.....								17,278,976.10	14,759,292.08	2,519,684.02

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

RECAPITULATION.

Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.	Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
1839...	\$1,000.00	\$1,000.00	.....	1877..	\$194,686.96	\$188,206.19	\$6,480.77
1840.....	.....	.....	.....	1878..	198,640.00	197,634.94	1,005.06
1841.....	.....	.....	.....	1879..	206,400.00	206,360.00	40.00
1842.....	1,000.00	1,000.00	.....	1880..	199,500.00	198,361.72	1,138.28
1843.....	.....	.....	.....	1881..	275,460.31	267,603.84	¹ 7,851.47
1844.....	2,000.00	2,000.00	.....	1882..	363,011.05	354,482.39	² 8,528.66
1845.....	2,000.00	2,000.00	.....	1883..	456,396.11	438,941.72	³ 17,454.39
1846.....	3,000.00	3,000.00	.....	1884..	⁴ 416,641.13	413,618.09	³ 3,023.04
1847.....	3,000.00	3,000.00	.....	1885..	⁴ 655,930.25	558,934.89	⁵ 96,995.36
1848.....	⁴ 4,500.00	⁴ 4,500.00	.....	1886..	⁴ 677,973.22	519,196.11	158,777.11
1849.....	3,500.00	3,500.00	.....	1887..	⁴ 657,641.81	628,287.14	29,354.67
1850.....	5,500.00	5,500.00	.....	1888 ⁶ ..	1,027,219.06	1,011,282.62	15,936.44
1851.....	5,500.00	5,500.00	.....	1889..	⁴ 1,134,480.60	1,033,590.22	⁷ 100,890.38
1852.....	5,000.00	5,000.00	.....	1890..	⁴ 1,170,139.11	971,823.62	⁸ 198,315.49
1853.....	5,000.00	5,000.00	.....	1891..	⁴ 1,372,049.21	1,266,277.36	105,771.85
1854.....	10,000.00	10,000.00	.....	1892..	⁴ 2,303,655.75	2,253,262.29	50,393.46
1855.....	⁴ 50,000.00	50,000.00	.....	1893..	2,540,060.72	2,355,430.25	184,630.47
1856.....	30,000.00	30,000.00	.....	1894..	2,603,855.58	1,977,469.28	⁹ 626,386.30
1857.....	75,000.00	75,000.00	.....	1895..	⁹ 2,506,915.00	2,021,030.38	485,884.62
1858.....	63,500.00	63,157.25	\$342.75	1896..	2,584,013.22	2,094,916.42	489,096.80
1859.....	60,000.00	60,000.00	.....	1897..	2,448,763.53	2,348,512.98	100,250.55
1860.....	40,000.00	40,000.00	.....	1898..	2,467,902.00	2,425,510.44	42,391.56
1861.....	60,000.00	60,000.00	.....	1899..	2,829,702.00	2,827,795.65	28,899.27
1862.....	64,000.00	63,704.21	295.79	1900..	3,006,022.00	2,947,603.42	58,418.58
1863.....	80,000.00	80,000.00	.....	1901..	3,304,265.97	3,239,137.39	65,128.58
1864.....	199,770.00	189,270.00	10,500.00	1902..	3,922,780.51	3,902,675.79	20,104.72
1865.....	112,304.05	112,196.55	107.50	1903..	5,015,846.00	4,734,230.84	281,615.16
1866.....	167,787.82	167,787.82	.....	1904..	5,025,024.01	4,969,311.64	55,712.37
1867.....	199,100.00	199,100.00	.....	1905..	5,894,540.00	5,820,204.00	74,336.00
1868.....	279,020.00	277,094.34	1,925.66	1906..	6,225,690.00	6,029,510.02	196,179.98
1869.....	172,593.00	172,593.00	.....	1907..	9,505,484.74	9,025,318.93	1,200,165.81
1870.....	156,440.00	151,596.93	4,843.07	1908..	11,487,950.82	11,045,412.19	442,538.63
1871.....	¹ 188,180.00	186,876.81	1,303.19	1909..	15,385,806.00	15,079,472.29	306,333.71
1872.....	197,070.00	195,977.25	1,092.75	1910 ¹⁰ ..	15,470,634.16	13,794,231.97	1,676,402.19
1873.....	202,440.00	201,321.22	1,118.78	1911 ¹⁰ ..	17,278,976.10	14,750,292.08	2,519,684.02
1874.....	257,690.00	233,765.78	23,924.22	Total..	¹¹ 133,417,252.40	¹² 123,782,111.19	¹³ 10,440,903.76
1875.....	337,380.00	321,079.83	16,300.17				
1876.....	249,120.00	198,843.64	50,276.36				

¹ Includes \$1,646.45 of the appropriation for reclamation of arid lands, carried to the fiscal year 1882.² Includes \$85.26 of the appropriation for reclamation of arid lands and \$3,530.85 of the appropriation for experiments in the manufacture of sugar, carried to the fiscal year 1883.³ Includes \$7,656.13 of the appropriation for reclamation of arid lands, carried to the fiscal year 1884.⁴ Including deficiency appropriation.⁵ Includes \$93,192.27 of the appropriation for Bureau of Animal Industry and \$2,970.82 of the appropriation for quarantine stations, carried to the fiscal year 1886.⁶ For the fiscal year 1888, including the sum of \$3,000 appropriated for deficiencies in the appropriation for experiments in the manufacture of sugar for the fiscal years 1887 and 1888, of which \$7,927.50 was disbursed and \$72.50 remained unexpended.⁷ Includes \$12,923.25 of the appropriation for botanical investigations and \$58,364.76 of the appropriation for experiments in the manufacture of sugar, carried to the fiscal year 1890.⁸ Includes \$188,974.69 of the appropriation for Bureau of Animal Industry, carried to the fiscal year 1891.⁹ Includes \$7,891.94 for statutory salaries of the year 1894.¹⁰ For the years 1910 and 1911 the figures given represent payments made to close of June 30, 1911, the accounts for those years being still open at the date of this revision.¹¹ This total is the amount actually appropriated for the various fiscal years, with the exception of \$37,604.70 appropriated July 13, 1868, to cover a number of expenditures made in previous years. It does not include an aggregate sum of \$369,344.48 reappropriated from the unexpended balances of several fiscal years. (See foregoing notes.)¹² Does not include \$37,604.70 which was disbursed during several years and covered by an appropriation of like amount made July 13, 1868. (See note ¹¹.)¹³ Does not include an aggregate sum of \$369,344.48 reappropriated from the unexpended balances of several fiscal years. (See foregoing notes.)

REPORT OF THE EDITOR.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF PUBLICATIONS,
Washington, D. C., October 2, 1911.

SIR: I have the honor to submit herewith a report of the operations of the Division of Publications for the fiscal year ended June 30, 1911, some references to the work in contemplation for 1912, and a few recommendations in regard to the year 1913.

Respectfully,

JOS. A. ARNOLD,
Editor and Chief.

HON. JAMES WILSON,
Secretary of Agriculture.

SUMMARY.

The work consisted principally, as heretofore, in editing, indexing, illustrating, and distributing the 1,953 different bulletins, circulars, reports, documents, and all kinds of publications by the department, of which 27,594,877 copies were issued. This is an increase of nearly 10 per cent in both the number of copies printed and distributed by comparison with the preceding year. Of these, 27,250,250 were issued through this division and 344,627 were issued through the Weather Bureau. Of the total number, 18,467,677 were new and 9,126,600 were reprints of earlier publications. Of the more than 27,500,000 copies of publications noted above, 9,219,000 were Farmers' Bulletins and 18,375,877 were miscellaneous publications, including reports, bulletins, circulars, separates, etc. Of these miscellaneous publications, 16,414,277 were new and 1,961,600 were earlier publications reissued. Of the Farmers' Bulletins, 2,054,000 were new and 7,165,000 were reprints.

The aggregate number of employees was 193. Of these, 11 were employed in the office of the chief in connection with the administrative work of the division, 12 in the editorial office, 10 in indexing, 19 in drafting and photography, and 141 in the distribution of documents.

The aggregate expenditures were as follows: For printing and binding, \$450,512.11; for salaries of employees, all of whom are on the statutory roll, \$169,085.79, and for rent, materials and supplies, \$27,513.74.

The following is a comparative statement of the appropriations expended under the supervision of the division for the fiscal years 1908, 1909, 1910, and 1911:

Appropriations under the supervision of the Division of Publications for the fiscal years 1908-1911.

Appropriations.	1908	1909	1910	1911
Statutory roll of the division.....	\$126,550	\$139,710	\$173,450	\$172,730
General printing fund.....	408,750	435,000	435,000	435,000
General expenses of the division.....	35,000	40,000	33,000	30,000
Total.....	570,300	614,710	641,450	637,730

WORK OF THE YEAR.

In reviewing the operations of the Division of Publications for the year 1911, it is desirable to recall the fact that so far as the work is concerned there is no control possible by the editor save under the arbitrary limitation imposed by the appropriations. The extent of the work to be performed in the division is absolutely dependent upon the growth of the department and the activity of its various agencies, and this activity depends upon so many extraneous conditions that no chief of any single bureau, division, or office can approximate at the beginning of the year the amount of printing which he will require during the year. The volume of printing may therefore be accepted as an accurate index of the department's work.

It is the function of this division to meet the department's requirements for printing and binding, and accomplish this within the almost invariably inadequate appropriation. Hence the economies of the division tend in the editorial work to the condensation of statement and improvement in form, and in the distribution work to closer organization and increasing the efficiency by the use of machinery wherever possible.

In 1910, 1,983 separate and distinct publications, containing 42,503 pages, were issued, the total number of copies being 25,190,469. As the appropriations for the two years 1910 and 1911 for printing were identical and the number of employees in the division only slightly increased during the last year, it will be readily observed from the following pages how efficient were the efforts to meet the department's increasing demands.

Even with the increase in the number of copies of publications secured with the appropriation for 1911 it was impossible to supply the popular demand which comes from every section of the United States. The distribution of the enormous amount of reading matter widely disseminates information along agricultural lines and is productive of a higher yield of all kinds of crops, better breeds of stock, new varieties of fruits, and improved conditions on the farm, the financial value of which alone amounts to millions of dollars annually; but the increase in comfort, contentment, and cheer can not be estimated.

WEATHER BUREAU PUBLICATIONS.

Of the funds appropriated for the department's printing and binding a specific sum is allotted for the use of the Weather Bureau. All of these publications do not pass through this division as do other publications of this department. They are printed either at the Weather Bureau or at the Government Printing Office, are handled and stored at the bureau and distributed therefrom, and a report of the distribution is made to this office.

OCEAN AND GREAT LAKE CHARTS.—The bureau has continued the issue of meteorological charts of the oceans and Great Lakes. The charts are 21 by 28 inches in size, are printed in colors, and are published monthly and quarterly as shown herewith:

Monthly.	Copies.	Quarterly.	Copies.
North Atlantic.....	6,000	South Atlantic.....	2,250
North Pacific.....	2,900	South Pacific.....	2,250
Indian Ocean.....	2,100		
Great Lakes.....	1,200		

CLIMATOLOGICAL REPORTS.—From the 12 drainage districts of the United States climatological data are received and printed monthly, in quarto form, and in number averaging about 1,100 from a district.

WEATHER MAPS AND BULLETINS.—Weather Bureau stations in all the States issue a large number of maps, bulletins, and forecast cards. There was a large increase in the number of maps issued—6,000,000 in 1910; 8,000,000 in 1911.

Seventy-five stations issue weather maps and bulletins; 28 have printing outfits and others use duplicating processes. The station map is a sheet 11 by 16 inches, and the subscription price is 20 cents a month or \$2 a year. Weather Bureau stations issue forecast cards to the amount of 23,000,000 annually and disseminate local climatological data.

EXPENDITURES FOR PRINTING AND BINDING.

The number of requisitions for printing and binding drawn upon the Government Printing Office was 4,568. The allotment for printing and binding was the same as for the preceding year, namely, \$460,000. Of this amount \$25,000 was expended by the Weather Bureau. Of the remaining \$435,000 the expenditures for the various bureaus, divisions, and offices amounted to \$307,500.05, being \$17,729.48 more than for the year 1910; and \$118,012.06 was expended for Farmers' Bulletins, a decrease of \$8,567.31 by comparison with the preceding year.

A considerable amount of work of all kinds ordered from the Government Printing Office and urgently needed by the department could not be undertaken or completed on account of the unusual accumulation of printing required by Congress.

The amount expended from the printing fund for miscellaneous publications and for job printing and binding for the various bureaus, divisions, and offices is given in detail in the following table:

Amounts expended for the various bureaus, divisions, and offices for printing and binding, 1911.

Bureau, division, or office.	Amount.
Division of Accounts.....	\$5,999.62
Bureau of Animal Industry.....	24,684.10
Bureau of Biological Survey.....	6,574.14
Bureau of Chemistry.....	12,124.46
Bureau of Entomology.....	14,110.61
Office of Experiment Stations.....	34,351.48
Forest Service.....	26,330.28
Library.....	12,420.72
Bureau of Plant Industry.....	37,028.17
Division of Publications.....	11,679.26
Office of Public Roads.....	1,673.36
Bureau of Soils.....	7,352.74
Bureau of Statistics.....	22,757.75
Miscellaneous.....	20,681.89
Congressional.....	69,731.47
Total.....	307,500.05
Expended for Farmers' Bulletins.....	118,012.06
Expenditure by Weather Bureau.....	25,000.00
Grand total.....	450,512.11

Expenditures for different classes of publications, etc.

Farmers' Bulletins.....	\$118,012.06
Congressional publications.....	69,731.45
Periodical publications.....	32,863.91
Bulletins, circulars, extracts, etc.....	112,731.60
Administrative and minor publications, job printing, and binding.....	92,173.09
Total.....	425,512.11

Under job printing come stationery, circular letters, maps, blank forms, and a variety of miscellaneous supplies for which expenditures are necessarily large and have been growing rapidly owing to the increased field work of the bureaus. There has also been an increase in the expenditures for the publishing of administrative publications issued for the guidance of officers and employees, such as Food Inspection Decisions, Notices of Judgment, Service Announcements, Field Programs, etc. Through rigid economy the expenses for printing have been kept at the lowest possible point.

Output of publications from the department for the fiscal years 1908, 1909, 1910, and 1911, compared.

	1908	1909	1910	1911
Number of editions issued.....	1,522	1,758	1,983	1,953
Number of copies printed.....	16,875,515	17,190,345	25,190,469	27,594,811

FARMERS' BULLETINS.

Forty-eight new Farmers' Bulletins were issued during the year. This series of bulletins continues to be the most popular publications of the department. It is safe to say that 5,000,000 more could be

distributed if the department had the money to print and mail them. At present it is not possible to send half the number of different bulletins requested by applicants, and it is necessary to select and send a few likely to be most useful. By this course the number available is believed to be most wisely as well as widely distributed.

The following table shows the output of Farmers' Bulletins during the past five years and the expenditures therefor:

Output of Farmers' Bulletins and the cost for the fiscal years 1907, 1908, 1909, 1910, and 1911.

Fiscal year.	Fund drawn upon.	Number issued.	Number of copies.	Cost.
1907.....	Farmers' Bulletin fund.....	235	6,469,000	\$98,601.17
1908.....	do.....	252	6,574,500	98,601.49
1909.....	do.....	271	7,755,000	122,475.48
1910.....	do.....	299	9,337,500	126,579.37
1911.....	do.....	295	9,219,000	118,012.06

CONGRESSIONAL DISTRIBUTION.

The following table shows the growth of Farmers' Bulletins during the past 22 years, together with the growth and extent of the congressional distribution:

Growth of the Farmers' Bulletin series during 22 years, with congressional distribution.

Year.	New bulletins issued.	Copies issued.	Copies distributed by Congressmen.	Year.	New bulletins issued.	Copies issued.	Copies distributed by Congressmen.
1890-1893.....	12	540,000	.....	1904.....	25	6,435,000	4,895,556
1894.....	5	278,500	.....	1905.....	24	5,925,500	4,782,643
1895.....	11	1,567,000	885,770	1906.....	33	6,568,000	5,279,476
1896.....	13	1,891,000	1,316,695	1907.....	42	6,469,000	3,484,713
1897.....	16	2,387,000	1,967,237	1908.....	26	6,574,500	3,928,437
1898.....	21	2,170,000	1,580,065	1909.....	34	7,755,000	3,960,642
1899.....	22	2,437,000	1,101,985	1910.....	45	9,337,500	6,449,589
1900.....	18	2,360,000	1,666,909	1911.....	48	9,219,000	5,474,079
1901.....	14	3,345,000	2,195,010	Total....	454	88,011,000	57,212,908
1902.....	23	6,150,000	4,289,126				
1903.....	22	6,602,000	3,954,976				

The following table shows the number, title, and the number of copies of each new Farmers' Bulletin issued during the year:

New Farmers' Bulletins issued during the fiscal year ended June 30, 1911.

Bulletin No.	Title of bulletin.	Total number of copies.
407	The Potato as a Truck Crop.....	50,000
408	School Exercises in Plant Production.....	70,000
409	School Lessons on Corn.....	85,000
410	Potato Culls as a Source of Industrial Alcohol.....	20,000
411	Feeding Hogs in the South.....	60,000
412	Experiment Station Work—LVIII.....	20,000
413	The Care of Milk and Its Use in the Home.....	85,000
414	Corn Cultivation.....	115,000
415	Seed Corn.....	85,000
416	The Production of Cigar-leaf Tobacco in Pennsylvania.....	30,000
417	Rice Culture.....	25,000

New Farmers' Bulletins issued during the fiscal year ended June 30, 1911—Continued.

Bulletin No.	Title of bulletin.	Total number of copies.
418	Game Laws for 1910.....	85,000
419	Experiment Station Work—LIX.....	30,000
420	Oats: Distribution and Uses.....	30,000
421	Control of Blowing Soils.....	25,000
422	Demonstration Work on Southern Farms.....	50,000
423	Forest Nurseries for Schools.....	45,000
424	Oats: Growing the Crop.....	45,000
425	Experiment Station Work—LX.....	30,000
426	Canning Peaches on the Farm.....	40,000
427	Barley Culture in the Southern States.....	30,000
428	Testing Farm Seeds in the Home and in the Rural School.....	50,000
429	Industrial Alcohol: Sources and manufacture.....	20,000
430	Experiment Station Work—LXI.....	20,000
431	The Peanut.....	35,000
432	How a City Family Managed a Farm.....	40,000
433	Cabbage.....	40,000
434	The Home Production of Onion Seed and Sets.....	30,000
435	Experiment Station Work—LXII.....	90,000
436	Winter Oats for the South.....	15,000
437	A System of Tenant Farming and Its Results.....	30,000
438	Hog Houses.....	30,000
439	Anthrax, with Special Reference to Its Suppression.....	30,000
440	Spraying Peaches for the Control of Brown-Rot, Scab, and Curculio.....	45,000
441	Lespedeza, or Japan Clover.....	15,000
442	The Treatment of Bee Diseases.....	30,000
443	Barley: Growing the Crop.....	20,000
444	Remedies and Preventives Against Mosquitoes.....	90,000
445	Marketing Eggs Through the Creamery.....	20,000
446	The Choice of Crops for Alkali Land.....	30,000
447	Bees.....	30,000
448	Better Grain-Sorghum Crops.....	20,000
449	Rabies or Hydrophobia.....	64,000
450	Some Facts About Malaria.....	75,000
451	Experiment Station Work—LXIII.....	30,000
452	Capons and Caponizing.....	30,000
453	Danger of General Spread of the Gypsy and Brown-Tail Moths Through Imported Nursery Stock.....	50,000
456	Our Grosbeaks and Their Value to Agriculture.....	20,000
Total (48 bulletins).....		2,054,000

THE YEARBOOK FOR 1910.

The seventeenth volume of the Yearbook was issued May 10. It contained 28 articles, 49 full-page illustrations, 8 of which are colored, and 31 text figures in its 711 pages. The annual report of the Secretary, occupying the first 156 pages, supplemented by the statistical matter, found in the 211 pages of the Appendix, gives a more complete and comprehensive summary of agricultural conditions in the United States than can be found in any other single publication.

The 320 pages devoted to the 28 articles contributed by members of the scientific corps of the department contain data upon many of the important questions now prominent in the public eye and equally vital to the country and city population both as producers and consumers of the agricultural products of the nation.

The volume is distributed principally by Senators, Representatives, and Delegates in Congress, the department's quota being reserved for its volunteer correspondents.

REVISED EDITIONS OF THE HORSE AND CATTLE BOOKS.

Under joint resolutions of Congress, revised editions of the Special Report on Diseases of the Horse and the Special Report on Diseases of Cattle were authorized. The editions are limited to 100,000 copies each—70,000 for the use of the House and 30,000 for the use of the Senate. The Horse Book is now in press and will doubtless be issued

at an early date. The revised copy for the Cattle Book has not yet been submitted. The department will receive no quota of these reports, and therefore will have none for distribution.

NUMBER OF PUBLICATIONS ISSUED DURING THE PAST 21 YEARS.

The following statement shows the total number of copies of all publications of the department issued during the last 22 years, aggregating the enormous total of 223,572,467 copies:

Publications of all kinds issued by the department, 1890-1911.

Years.	Number issued.	Years.	Number issued.	Years.	Number issued.	Years.	Number issued.
1890.....	1,904,300	1896.....	6,561,700	1902.....	10,586,580	1908.....	16,875,516
1891.....	2,833,933	1897.....	6,541,210	1903.....	11,698,564	1909.....	17,190,345
1892.....	2,348,797	1898.....	6,280,365	1904.....	12,421,386	1910.....	25,190,465
1893.....	3,446,181	1899.....	7,075,975	1905.....	12,475,157	1911.....	27,594,877
1894.....	3,169,310	1900.....	7,152,428	1906.....	13,488,527		
1895.....	4,100,660	1901.....	7,889,281	1907.....	16,746,910	Total....	223,572,467

SALE OF THE DEPARTMENT'S PUBLICATIONS.

The Superintendent of Documents of the Government Printing Office sold 183,577 copies of this department's publications during the fiscal year, exceeding the sales of the previous year by 36,250, although the cash received by him was only \$258.99 more than was reported during the fiscal year ending June 30, 1910.

While the publications sold ranged from small circulars to bound volumes of 1,300 pages, the large increase in the number of copies sold and the small excess of last year's receipts over the previous year's indicate that the demand for the small popular pamphlets prepared for the use of the general reader has greatly increased, and at the expense of the larger and more technical bulletins and reports. The average price per document was about 11 cents, a decrease of 1½ cents.

It is rather remarkable that 68,320 copies of Farmers' Bulletins were sold by the Superintendent of Documents at 5 cents each, when millions were distributed free by the department and Senators and Representatives in Congress.

The increase in the sales of the department's publications within recent years is shown in the following table:

Sales of agricultural publications by the Superintendent of Documents during the fiscal years 1906-1911.

Years.	Number of copies.	Amount received.	Years.	Number of copies.	Amount received.
1906.....	47,745	\$5,388.28	1909.....	117,218	\$16,293.10
1907.....	71,764	10,885.20	1910.....	147,327	18,398.18
1908.....	94,926	14,174.22	1911.....	183,577	18,657.17

It will be observed that the number of copies sold during this fiscal year was about 385 per cent of the number sold in 1906.

AUTHORITY TO REPRINT.

Under the operation of a provision of the law, the Superintendent of Documents can reprint and sell any publication, so long as there

is a demand for it, without any expense to the department, thus enabling his office to operate on a strictly business basis, paying for the reprints out of receipts from previous sales, and making no drafts on the department's printing fund. Under this law applicants desiring or needing publications of the department can secure the same when the department's limited editions are exhausted and it is not possible for it to order additional copies.

In 1906 the Superintendent of Documents reprinted 43 publications of this department, the total number of copies issued being slightly over 10,000. During the fiscal year ending June 30, 1911, he reprinted 663 different publications, issuing a total of 170,325 copies, an increase in five years of 1,700 per cent.

Classes of agricultural publications reissued by the Superintendent of Documents during the fiscal year 1910-11.

Class of publication.	Number.	Copies.
Bulletins.....	305	95,825
Circulars.....	96	10,900
Unnumbered publications.....	30	14,300
Experiment Station Records.....	3	300
Farmers' bulletins.....	199	49,000
Total.....	633	170,325

The following table shows the agricultural publications reissued by the Superintendent of Documents, classified according to the main branch of the department which originally contributed them:

Agricultural publications reissued by the Superintendent of Documents during the fiscal year 1911, classified according to the bureau or office originally contributing them.

Bureau or office.	Number.	Copies.
Office of the Secretary.....	16	7,100
Bureau of Animal Industry.....	53	13,100
Biological Survey.....	14	4,700
Bureau of Chemistry.....	43	14,000
Bureau of Entomology.....	88	20,700
Office of Experiment Stations.....	71	23,525
Forest Service.....	39	11,100
Bureau of Plant Industry.....	55	13,600
Office of Public Roads.....	4	500
Bureau of Soils.....	45	12,400
Bureau of Statistics.....	4	400
Weather Bureau.....	1	100
Office of the Solicitor.....	1	100
Farmers' bulletins.....	199	49,000
Total.....	633	170,325

Under the law of January 12, 1895, all remittances for publications should be forwarded to the Superintendent of Documents, Government Printing Office. By instructions conspicuously printed at the head of the Monthly List of Publications correspondents are advised to apply to that official when they desire to obtain any publications after they have been advised that the department's supply is exhausted. Notwithstanding every effort to prevent it, money in payment for publications continues to come to this division, the amount received during the fiscal year being \$1,797.87, an increase of \$527.60, all of which was forwarded to the Superintendent of Documents by registered mail. A careful record of all amounts so received and forwarded was kept in the division.

DEPARTMENTAL ORDERS.

Several orders affecting the work of the division were issued during the year. The first, relating to reading the Congressional Record and the distribution of copies of bills and resolutions under discussion in Congress affecting the work of the department, is contained in the following letter:

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., December 5, 1910.

Mr. JOS. A. ARNOLD,
Editor and Chief, Division of Publications.

DEAR MR. ARNOLD: The special duty of reading the Congressional Record for the purpose of enabling the Secretary, Assistant Secretary, and Chief of the Division of Accounts to refer readily to the subjects that may be under discussion in Congress affecting the work of the department is hereby assigned to your supervision, likewise the receipt and distribution of the bills and resolutions which, under the law, are furnished to the department. You will also be charged with procuring additional copies of bills, resolutions, and reports thereon when necessary, and you are particularly enjoined to restrict such number to the actual requirements, bringing to my attention any requests that you may receive from any bureau, division, or office for a number which, in your judgment, seems excessive. The Chief of the Bureau of Statistics, under whose direction these duties have heretofore been performed, has already been advised of the transfer of the same to you.

Very respectfully,

(Signed) JAMES WILSON,
Secretary.

This work has been performed in the index section and, owing to the extra session of Congress, has been more onerous than usual.

STYLE OF PUBLICATIONS.

The second in the matter of time, relating to the new Style Book of the Government Printing Office, appears in the following letter addressed to the chiefs of bureaus, divisions, and offices:

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., February 15, 1911.

CHIEFS OF BUREAUS, DIVISIONS, AND OFFICES:

The department has received copies of the new Style Book of the Government Printing Office, containing instructions in regard to the form, size, style, composition, orthography, etc., to be followed in the publications of the Government. This manual is based upon the usage of the leading publishing houses and the preferences of the executive departments, and is designed to secure uniformity and economy in the publication work of the Government. It is my desire that this Style Book be followed in all printing for this department, and I have so instructed the Editor and Chief of the Division of Publications, to whom all details of the publication work are intrusted.

Very respectfully,

(Signed) JAMES WILSON,
Secretary.

The carrying out of this order devolved upon the editorial section, and has resulted in a somewhat more uniform style in the various publications of the department, although there is still a sufficient amount of variety allowed to avoid a too rigid conformity to any one style and to permit an accommodation to the needs of the bureaus, as reflected in the illustrations and the style formerly followed in an established series of bulletins.

RECOMMENDATIONS OF THE COMMITTEE ON EFFICIENCY AND ECONOMY.

Under date of June 14, 1911, the Committee on Efficiency and Economy appointed September 29, 1910, submitted its report, the recommendations in which were approved June 21, 1911, and the chiefs of bureaus, offices, and independent divisions, and the chief clerk of the department were directed to put it into effect at once.

The recommendations of that committee changing or affecting the conduct of work in this division are as follows:

Drafting.—(1) That the drafting work in the several different bureaus be not removed to a central division, because of the fact that, in the opinion of the committee, such work serves an administrative as well as an illustrative purpose, and that any such removal would result in numerous embarrassments and would make the work ineffective.

(2) That there be assumed to exist a better spirit of cooperation between the bureaus and the Division of Publications than now appears to exist.

(3) That, generally speaking, the Division of Publications be called upon to make all ordinary drawings for publications.

(4) That the term "ordinary drawings" be understood to exclude entomological and pathological drawings and others of a like technical nature requiring specialized knowledge on the part of the employees executing them, also such as require to be done upon a moment's notice, and such as require the continuous expert supervision of scientists.

Editorial.—(1) That the reading and revising of manuscripts by the bureaus be continued; that the bureaus be held responsible for the accuracy of statements and the form of presentation; that the Division of Publications conduct such review of manuscripts and reference to the various bureaus of the department as may be necessary from the standpoint of the Secretary's office, and mark them for the Government Printing Office; it being understood that the Division of Publications makes no change in statement without the approval or knowledge of the bureau from which the proposed publication emanates. It is further recommended that the Division of Publications establish a uniformity of style in the publications of the various bureaus, and determine the form, size, type, number, and character of illustrations, the edition to be printed of each publication, having the same authority with regard to job work of all kinds, with the object of securing economy and efficiency in the department printing.

(2) That all proof reading, except such as is done by the author, be done in the Division of Publications. It should be understood, however, that any changes made by the author in the proof shall be made with the approval of his chief of bureau.

(3) That all indexing be turned over to the Division of Publications.

* * * * *

(6) That it is not advisable that the employees of the so-called editorial forces of the bureaus should be transferred to the Division of Publications.

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Photography.—(3) That some form of notes of exposure be used for the record and identification of photographs as an aid to the photographer in developing and printing.

(4) That copying of maps by photography should be utilized to the fullest extent practicable, inasmuch as a great deal of work now done by draftsmen might well be done by photography.

(5) That the making of bromide enlargements be continued.

(6) That where the making of transparencies is continued this should be limited to offices where their exhibition will have an educational value to visitors, and not be merely for purposes of office decoration.

(7) That the making of blueprints as an aid to construction work wherever they will serve, instead of bromide enlargements or lantern slides, should be encouraged to the fullest extent.

(8) That extreme care should be taken through constant supervision and careful indexing to provide against unnecessary duplication in lantern-slide subjects or in making slides bearing only remotely upon the work of the bureau, also that safeguards and limitations be observed in the loan and sale of slides for the purpose of illustrating lectures; that loans should be made only where it is clear that they are to be used for educational purposes along lines followed by the bureaus themselves.

* * * * *

(11) That the manner of filing negatives should be made uniform throughout the department; that the negatives of all photographs produced for the publications of the department be turned over to the Division of Publications with all manuscripts submitted, and that all files of negatives be kept in fireproof vaults or cases.

(12) That no further steps be taken toward a centralization of all the photographic work in a general laboratory, but that those bureaus which find it convenient through proximity to the laboratory of Publications be authorized to make use of its facilities.

Publications.—(1) That as a means of identification all publications and circulars of information, except instructions to employees, be given a serial number or form number, and that, whereas some of the bureaus now have circulars addressed primarily for information and use of employees within the bureau, some of which are distributed to miscellaneous applicants, these, as well as all forms of every description, should bear a serial number.

(2) That all publications continue to be distributed by the Division of Publications, in accordance with the provisions of section 92 of the act of January 12, 1895, and that all requests for specific publications of the department be forwarded to the Division of Publications for attention, in order that by concentration of the distribution of publications and by centralizing the correspondence duplication and confusion may be avoided. Exception should be made, however, where special circumstances make a letter from the bureau desirable, as in cases where a bureau is cooperating with a State, municipal, or other official.

(3) That the department turn over to the Superintendent of Documents all publications, except a reserve of 25 copies, remaining undistributed after two years from the date of issue, to be sold by him under the law. This action is believed to be necessary in order to prevent the accumulation of documents and the rental of additional storage room.

(4) That the Bureau of Animal Industry list, known as the "general mailing list," kept standing in type in the rubber-stamp section of the Office of the Secretary, be turned over to the Division of Publications and stenciled, to be used for mailing publications when requested. The other lists of the bureau which are kept at the rubber-stamp section are for use in mailing service announcements, instructions to employees, circular letters, and a special list of southern newspapers which occasionally receive such information as the bureau may prepare relating to tick eradication, and may properly be maintained as at present; also, that each subdivision of the lists turned over to the Division of Publications be "keyed," so that any name may be readily located.

(5) That all lists of the Bureau of Statistics now in the rubber-stamp section be turned over to the Division of Publications.

(6) The Biological Survey keep a card list from which it writes franks or addressed envelopes which are furnished to the Division of Publications for mailing such publications as the Fauna, which are not for general distribution. This list is very small, and it would seem to be a waste of time and money to transfer it to the Division of Publications to be put on stencil.

(7) That the List of Station Publications received by the Office of Experiment Stations be discontinued.

(8) That all mailing lists be revised and brought up to date at least once in every two years.

(9) That in all cases where franks or envelopes for special lists are addressed in a bureau or office, except letters of instruction to employees, they be sent to the Division of Publications for use in mailing the desired publications; and that no envelopes or franks, after being addressed in the Division of Publications, be forwarded to any bureau for the purpose of mailing any publication, press notice, circular letter, etc.

* * * * *

(11) That all publications that are to be sent to England, Germany, and France be forwarded through the Smithsonian Institution.

(12) That all miscellaneous foreign letters requesting publications be forwarded to the librarian. This is advisable in order that the Librarian may ascertain whether the writers are in a position to exchange publications. If not, the letters should be turned over to the Division of Publications for attention and reply. If the writer, in the opinion of the Librarian, should receive the publications requested, an order will be sent to the Division of Publications and the letter answered by the Librarian.

Publicity.—(1) That each bureau take special pains to inform the Division of Publications, by personal call or memorandum, of any feature of its work that may be of public interest.

(2) That all press notices be headed "U. S. Department of Agriculture, Office of the Secretary," and be approved by the Secretary before being sent out.

(3) That all mimeographing, addressing of envelopes, and the actual mailing of such notices be done by the Division of Publications. This should not, however, include lists which are not in type and which are used but once or twice a year.

(4) That all mailing lists for such press notices be concentrated in the Division of Publications, subject to the same exception as in the preceding recommendation.

EDITING.

The magnitude of the work devolving upon the editors is apparent when the vast number of publications issued and the enormous amount of miscellaneous printing required by the department are taken into consideration. The duties are comparable to those of editors in a large publishing house, and involve expert knowledge and experience. They examine and report upon the numerous manuscripts submitted and prepare them for publication in suitable as well as the most economical form. In the progress of the work it is customary to consult with the author of the contributing bureau, with the view to perfecting the manuscripts and expediting their publication. The same vigilance is exercised in regard to miscellaneous printing. Every detail is carefully considered and every possible economy effected so as to secure for the department the largest amount of printing from the available fund.

The policy of keeping the chiefs of bureaus informed concerning the scope and character of all manuscripts submitted for publication has been continued, with satisfactory results. This feature of the work involved consultation with authors of manuscripts and with the chiefs of the bureaus in which the manuscripts originate. This duty and the frequent necessary visits to the Government Printing Office, to assist in settling questions and difficulties which arise in connection with the printing of the department's publications, added to supervising the work of his assistants and keeping the necessary records of the progress of the manuscripts, occupied a considerable portion of the time of the assistant chief who is in charge of the editorial office.

Considerable time was devoted to the job work of the department. Advice and assistance was given in the preparation of blank forms and other classes of work. In many cases large savings were effected in the cost by reductions or changes in the shape or size of proposed jobs, thereby eliminating waste in cutting the paper. Often the quality of paper was changed when a cheaper grade would serve the purpose as well as the more expensive. All proofs of job work were read in the division.

Many calls for the compilation of matter, for the preparation of abstracts and press notices, and for the production of original matter on a wide variety of subjects have been promptly and satisfactorily met. Perhaps the most striking feature of the editorial work was its success in promoting economy. Many manuscripts were reduced in size; the illustrations were limited to those absolutely necessary to elucidate the text; and the tabular matter was greatly condensed.

The use of more durable paper for some of the publications of the department has been considered, with the result that 50 per cent rag paper is now being employed for the regular bulletins which do not contain any half-tone text illustrations. This will insure the permanent preservation of the department's most valuable publications, and at the same time the weight of the bulletins will be considerably decreased. For those bulletins that contain half-tone text illustrations 120-pound paper has been selected, the heavier 140-pound paper having been eliminated. For publications issued in large editions a much lighter paper, namely, 40-pound machine finish, has been adopted, reducing the expense as well as the weight by a little more than one-sixth.

The economy effected in this line of work, however, is not confined to the manuscripts and illustrations as submitted; for the division's stand in favor of economy in publication work has exerted a healthful influence throughout the department, tending to a more careful preparation of the manuscripts, a more careful selection and elimination of illustrations, and less changes in galley and page proofs in the various offices where the publications originated.

It is well understood by those experienced in editorial work that it is an impossibility to show in detail and in a numerical way the work done by an editorial staff—to give statistically the amount of work done on a manuscript, whether printed or rejected, or to express in dollars and cents the amount saved by reductions, rearrangements, eliminations, or other improvements made in a manuscript or by withholding its publication entirely. In fact, much of the miscellaneous work of the editorial office is of so varied a character that it is impracticable to even keep a record of it. Nevertheless, the following tables, presenting a complete statement of the publications issued by the department, will, by the great bulk of printed matter issued, give a fair idea to the experienced man of the large amount of work demanded of the division's small editorial force.

The editors are crowded into one large room, together with book-cases, card cabinets, and pamphlet cases, so that there is too close proximity of desks, and too much noise from typewriting machines for sustained concentration of thought upon their work and the production of the best results. Added space would not only result in convenience and comfort to the editors, but would greatly increase the output, equal to at least one hour per man per day or the equivalent of an additional editor, who is already a pressing necessity.

SUMMARY OF PUBLICATIONS PRINTED.

Publications issued by the department during the fiscal year 1911, classified according to the bureau, division, or office contributing them.

ALL PUBLICATIONS EXCEPT FARMERS' BULLETINS.

Bureau, division, or office contributing publications.	New.			Earlier issues reprinted.			Total.		
	Number.	Pages.	Copies.	Number.	Pages.	Copies.	Number.	Pages.	Copies.
Secretary's office:									
Congressional.....	46	4,456	212,000	.....	.....	.....	46	4,456	212,000
Departmental.....	585	1,767	6,422,600	178	287	191,250	763	2,054	6,613,850
Division of Accounts..	2	76	5,200	.....	.....	.....	2	76	5,200
Bureau of Animal									
Industry.....	102	2,653	420,900	38	951	105,750	140	3,604	526,650
Biological Survey.....	14	602	58,500	9	634	15,000	23	1,236	73,500
Bureau of Chemistry..	33	808	129,750	14	1,358	18,600	47	2,166	148,350
Bureau of Entomology..	65	2,253	187,000	59	1,639	139,000	124	3,892	326,000
Office of Experiment									
Stations.....	79	4,182	401,600	29	991	268,500	108	5,173	670,100
Forest Service.....	31	1,078	238,100	71	1,367	209,000	102	2,445	447,100
Library.....	13	358	11,500	.....	.....	.....	13	358	11,500
Bureau of Plant Industry.....	69	2,832	1,077,800	41	933	959,000	110	3,765	2,036,800
Division of Publications.....	38	297	4,617,000	4	364	30,000	42	661	4,647,000
Office of Public Roads..	4	134	34,500	5	67	16,000	9	201	50,500
Bureau of Soils.....	21	1,137	57,700	2	54	4,000	23	1,191	61,700
Bureau of Statistics....	20	703	2,241,000	2	14	5,000	22	717	2,246,000
Weather Bureau.....	83	4,728	299,127	1	15	500	84	4,743	299,627
Total.....	1,205	28,064	16,414,277	453	8,674	1,961,600	1,658	36,738	18,375,877

Publications issued by the department during the fiscal year 1911, classified according to the bureau, division, or office contributing them—Continued.

FARMERS' BULLETINS.

Bureau, Division, or office contributing publications.	New.			Earlier issues reprinted.			Total.		
	Number.	Pages.	Copies.	Number.	Pages.	Copies.	Number.	Pages.	Copies.
Bureau of Animal Industry.....	7	173	320,000	30	979	1,095,000	37	1,152	1,415,000
Biological Survey.....	2	61	105,000	7	207	90,000	9	268	195,000
Bureau of Chemistry..	2	72	40,000	5	104	270,000	7	176	310,000
Bureau of Entomology.....	5	120	280,000	11	358	210,000	16	478	490,000
Office of Experiment Stations.....	9	253	420,000	83	2,770	2,525,000	92	3,023	2,945,000
Forest Service.....				5	155	75,000	5	155	75,000
Bureau of Plant Industry.....	22	641	864,000	87	2,315	2,270,000	109	2,956	3,134,000
Division of Publications.....				4	143	105,000	4	143	105,000
Office of Public Roads.....				6	166	400,000	6	166	400,000
Bureau of Soils.....	1	23	25,000	6	153	80,000	7	176	105,000
Weather Bureau.....				3	89	45,000	3	89	45,000
Total.....	48	1,343	2,054,000	247	7,439	7,165,000	295	8,782	9,219,000

ALL PUBLICATIONS, INCLUDING FARMERS' BULLETINS.

Secretary's office:									
Congressional.....	46	4,456	212,000				46	4,456	212,000
Departmental.....	585	1,767	6,422,000	178	287	191,250	763	2,054	6,613,850
Division of Accounts.....	2	76	5,200				2	76	5,200
Bureau of Animal Industry.....	109	2,826	740,900	68	1,930	1,200,750	177	4,756	1,941,650
Biological Survey.....	16	663	163,500	16	850	105,000	32	1,513	268,500
Bureau of Chemistry..	35	880	169,750	19	1,462	288,600	54	2,342	458,350
Bureau of Entomology.....	70	2,373	467,000	70	1,997	349,000	140	4,370	816,000
Office of Experiment Stations.....	88	4,435	821,600	112	3,761	2,793,500	200	8,196	3,615,100
Forest Service.....	31	1,078	238,100	76	1,522	284,000	107	2,600	522,100
Library.....	13	358	11,500				13	358	11,500
Bureau of Plant Industry.....	91	3,473	1,941,800	128	3,248	3,229,000	219	6,721	5,170,800
Division of Publications.....	38	297	4,617,000	8	507	135,000	46	804	4,752,000
Office of Public Roads.....	4	134	34,500	11	233	416,000	15	367	450,500
Bureau of Soils.....	22	1,160	82,700	8	207	84,000	30	1,367	166,700
Bureau of Statistics.....	20	703	2,241,000	2	14	5,000	22	717	2,246,000
Weather Bureau.....	83	4,728	299,127	4	104	45,500	87	4,832	344,627
Total.....	1,253	29,407	18,467,677	700	16,123	9,126,600	1,953	45,530	27,594,877

The detailed statement showing the number of publications, by bureaus, divisions, and officers, received and distributed during the year will appear in the report to Congress, the printing of which is authorized by law.

INDEXING.

The available index was changed to some extent during the year to meet the change in the policy of distributing the department publications under which nearly all publications are sent free to all applicants while the supply lasts. An indexed list was added in a separate case from which books can be quoted for sale by the Superintendent of Documents, and it is proposed to add to this all the cards showing books unavailable here but for sale by that official. This will relieve the available index and make it easier to handle.

The general index is growing rapidly, and it is hoped an opportunity will soon be found to overhaul it and make it more complete and useful. The demand for its use has grown slowly, and it seems very desirable that its advantages should in some systematic way be drawn to the attention of students and writers throughout the department at least, if not throughout the country.

There is reason to hope that it will in time sufficiently prove its usefulness to justify having it printed on cards and distributed generally. Before this is done, however, it must be completed, revised, and perfected.

The most important change in policy in the history of the section was foreshadowed at the close of the fiscal year. This was the decision of the Secretary that all indexes for department publications should be made here, and it is hoped a good report can be made in this for the current year. The indexes made for such books during the fiscal year 1911 have been much the same as previously, including indexes of the Yearbook and other general publications and a few indexes of bulletins prepared in the bureaus, divisions, and offices.

The writing of letters on general requests for publications ran perhaps a little heavier than in any previous year, the total number of letters being 8,017. The orders made in connection with these letters number 12,026. The number of index cards prepared was 21,829, and the number of copies made was 45,767, making in all 67,586.

The circulars of the division carrying lists of publications for distribution, Nos. 2, 3, and 4, were replaced near the close of the year by circulars for each separate branch of the department, and the older lists are no longer issued. But Circular 1, Organization of the Department, and the Monthly List of Publications are still compiled and edited here.

The work of the current year will include a revision of Bulletin 3, of the department, already begun, and the compilation of a supplement to Bulletin 6, the complete list of the department books. Also a general index for the Yearbooks 1906-1910 will be prepared, to be printed as a bulletin of this division.

A considerable portion of the time of the assistant in charge of indexing is occupied in examining and rating papers for the United States Civil Service Commission.

The space assigned to the index section is 418 square feet. Three-fifths of this is taken up with file cases, bookcases, desks, and tables necessary to the transaction of the business sent there. The remainder, 169 square feet, is divided between necessary passways through the room, which are often as narrow as 18 inches, and the 10 persons regularly employed in the work. Another room equal in size to that now occupied is urgently needed to provide adequate quarters for this branch of the work.

ILLUSTRATING.

During the year 1,566 drawings were prepared by the three draftsmen, as compared with 1,460 in the preceding year. Many of these drawings were either large or intricate, and sometimes both, requiring an unusual amount of time and care, so that the numerical increase does not fully show the amount and character of the work done.

The growth of the photographic work has continued with no increase of force. The total amount of the output was 79,224 pieces. The accompanying tables give in detail the drafting and photographic work, but can not convey an adequate idea of the constantly increasing demand upon this office from the other bureaus of the department, nor do they show the amount of labor and skill necessarily required to produce such technically and artistically correct illustrations.

The additional space secured two years ago, comprising the entire attic floor of the old main building, made it possible to increase the output, but there is still need of additional apparatus and conveniences and quarters better adapted to the class of work performed. Proper ventilation and cooling of the dark rooms are imperative and would result in a still more satisfactory showing. The output of this office is primarily intended to illustrate reports of investigations conducted by the department's scientific staff, and must be of the highest order, and as demands are constantly made upon the department for photographic prints, lantern slides, etc., prepared from illustrations appearing in the department's reports, negatives and original drawings of all such should be filed in this division. While some progress has been made in this direction, a great majority of the department's negatives are still scattered among the offices in the different bureaus, and in the effort to comply with the increasing demands from miscellaneous applicants for photographic prints, lantern slides, etc., it frequently becomes necessary to devote much time to searching the files of the different bureaus of the department in order to locate and secure the negatives from which the prints and slides desired could be made. In many cases it is impossible to secure the original negative because of the unclassified condition of those in the possession of the bureaus and of the authors of the documents.

The conditions emphasize the desirability of concentrating as far as possible all negatives and original drawings used in illustrating the department's publications in this office, as directed by the Secretary's order of June 21, 1911. A conference in advance of the submission of illustrations with the expert in charge would result in securing the greatest possible volume of work for the least outlay of time and money.

Drawings made during fiscal year 1910-11.

Office of the Secretary.....	110	Bureau of Entomology.....	86
Bureau of Plant Industry.....	356	Office of Experiment Stations.....	142
Bureau of Animal Industry.....	370	Division of Accounts.....	35
Bureau of Chemistry.....	94	Division of Publications.....	114
Bureau of Biological Survey.....	140	Office of Public Roads.....	39
Bureau of Statistics.....	40		
Bureau of Soils.....	40	Total.....	1,566

Photographic work done for the different bureaus, divisions, and offices of the department and for the public during the fiscal year ended June 30, 1911.

Bureau, division, or office.	Velox prints.	Lantern slides.	Negatives made.	Plates and films developed.	Lantern slides colored.	Bromide enlargements.	Blue prints.	Solar bromides.	Prints mounted.	Reproduction prints.
Office of Secretary.....	23	235			35					
Assistant Secretary.....	649	44	100	28	8	2	3			
Chief clerk.....	21		35			200	12	73	200	
Office of Solicitor.....	20		10				4	55		
Chief engineer.....							64			
Division of Accounts.....								339		
Bureau of Animal Industry.....	3,390	425	436	744		338	4,009	119	1,656	
Biological Survey.....								2		
Bureau of Chemistry.....	3,707	157	204	41			296	48		
Bureau of Entomology.....	3,037	309	289	108	12	9		9	1,421	
Office of Experiment Stations.....	2,265	449	187	110	65	13	1,564	433	53	
Division of Publications.....	2,067	52	117			1	30	111		70
Bureau of Plant Industry.....	32,163	1,940	3,089	2,643	109	2,369		440	1,571	
Office of Public Roads.....	886		1				453	149	3	
Bureau of Soils.....							7			
Bureau of Statistics.....	18	1	26			22	4	101	22	
Paid orders.....	1,977	616				79		22		

Summary of illustration work during the fiscal year ended June 30, 1911.

Photographic work:

Velox prints.....	50,223
Negatives made.....	4,494
Developed (plates and films).....	3,674
Bromide enlargements.....	3,033
Mounted (prints and enlargements).....	4,926
Blue prints.....	6,446
Solar bromides.....	1,901
Lantern slides.....	4,228
Lantern slides colored.....	229
Repro prints.....	70

79,224

Drawings, electrotypes, etc.:

Number of requests for duplicate electros.....	137
Number of duplicate electros furnished to correspondents.....	1,252
Number of illustrations printed or published, not including reprints.....	1,739
Number of drawings made.....	1,566

Two hundred and twenty-four orders for photographic work, requiring the reproduction of 2,694 photographs, for which applicants paid the department \$596.53, were made, and 1,252 duplicate electros were furnished to correspondents, for which they paid to the electrotypewriter the regular price per square inch.

DISTRIBUTING PUBLICATIONS.

There were on hand on July 1, 1910, 5,811,410 publications. During the fiscal year ended June 30, 1911, there were received 25,635,272 publications. The number of copies received and the number on hand July 1, 1910, made available for distribution during the fiscal year ended June 30, 1911, 31,446,682 publications, of which number 25,591,555 copies were distributed, leaving on hand a balance of 5,855,127 copies of publications of all kinds. Of the entire number of documents received, 16,304,908 copies were of the miscellaneous class and 9,330,364 copies were Farmers' Bulletins.

Of the miscellaneous publications there were distributed 17,066,839, or 3,409,872 copies more than during the previous year, and 761,931 more than were received from the printer, the excess, of course, being supplied from the number on hand July 1, 1910. The number on hand July 1, 1911, was 3,387,637 copies.

DOMESTIC DISTRIBUTION.

During the fiscal year ended June 30, 1911, there were available for distribution 10,972,206 Farmers' Bulletins, of which 8,524,716 copies were distributed—on requests of Members of Congress 5,474,079 copies, and 3,050,637 copies on requests from miscellaneous applicants, leaving 2,447,490 copies on hand June 30, 1911.

In addition to the Farmers' Bulletins distributed there were sent out on orders of Members of Congress 1,112,000 Farmers' Bulletin lists.

Following is a statement showing the distribution of Farmers' Bulletins for the year:

Congressional distribution, 1910-11.....	5, 474, 079
Miscellaneous distribution, 1910-11.....	3, 050, 637
Total distribution, 1910-11.....	8, 524, 716

The receiving, handling, and distribution of over 25,000,000 publications required laborious and painstaking work and it was accomplished with celerity and remarkable accuracy.

It affords me much satisfaction to state that although it was recently necessary by order of the building inspectors of the District of Columbia to change the entire arrangement for storing publications, that work was accomplished without any serious interference with the general work of distributing publications. The gigantic task of changing the position and rearranging the millions of publications that were on hand in this office at the time could not have been accomplished except by systematic and conscientious effort. During the period while the bins were being torn out and the new ones erected, the employees worked with exceptional energy and faithfulness both day and evening.

FOREIGN MAIL.

An important factor of the work in connection with the distribution of publications is that of the foreign-mail distribution. This entire work requires great care and accuracy. Recently, upon the recommendation of the Committee on Efficiency and Economy, the mail to England, Germany, and France is sent through the Smithsonian Exchange.

During the fiscal year 1910-11, 85,544 packages of mail matter, weighing 32,585.3 pounds and requiring \$1,952.05 worth of postage, were sent through this office. These figures do not include the 6,222 packages, weighing 2,492 pounds, forwarded through the Smithsonian Exchange. A statement showing the amount of foreign mail sent on the orders of the different bureaus, divisions, and offices, and giving the weight and cost of postage, etc., follows:

Summary for report of foreign mail for the year ending June 30, 1911.

Bureau, division, or office.	Packages requiring postage.			Sent under frank.		Sent through Smithsonian Institution.	
	Number.	Weight.	Postage.	Number.	Weight.	Number.	Weight.
		<i>Pounds.</i>			<i>Pounds.</i>		<i>Pounds.</i>
Department library	13,154	6,298.8	\$503.91	3,036	1,295.7	631	301
Division of Publications	9,852	1,513.0	121.04	5,962	815.1	76	33
Office of Experiment Stations	9,495	6,954.0	556.32	2,931	1,466.3	1,012	434
Bureau of Chemistry	7,786	1,988.8	159.11	1,880	527.5	916	286
Bureau of Entomology	5,411	1,951.0	156.08	1,074	407.6	1,134	454
Bureau of Statistics	3,881	720.6	57.65	243	81.3	209	84
Bureau of Plant Industry	3,784	1,490.1	119.21	672	294.2	472	189
Bureau of Animal Industry	3,573	1,703.1	136.25	640	327.8	677	271
Bureau of Soils	2,019	697.0	55.76	200	91.7	382	153
Forest Service	1,905	661.8	52.95	497	235.5	440	202
Biological Survey	991	393.0	31.44	239	110.1	211	84
Office of Public Roads	38	27.7	2.22	46	26.3	2	1
Office of the Solicitor	6	.7	.06				
Office of the Secretary	1	.6	.05	6	13.2		
Total for fiscal year 1911	61,896	24,400.2	1,952.05	17,426	5,692.3	6,222	2,492
Total for fiscal year 1910	84,076	28,870.8	2,572.52	26,027	7,979.7	585	1,951
Decrease during fiscal year 1911	22,180	4,469.6	620.47	8,601	2,287.4	(1)	(1)

¹Shipments through the Smithsonian Institution exceeded last year by 5,637 packages, 540 pounds.

Packages sent abroad during fiscal year 1911.

Item.	Number.	Weight.	Postage.
		<i>Pounds.</i>	
Packages sent under postage (Canada, Cuba, and Mexico not included) ..	61,896	24,400.2	\$1,952.05
Packages sent under frank (Canada, Cuba, and Mexico)	17,426	5,692.3	None.
Packages sent through Smithsonian exchange	6,222	2,492.0	(1)
Grand total	85,544	32,584.5	1,952.05

¹ The Smithsonian Institution is reimbursed from the department's contingent fund at the rate of 5 cents per pound.

MECHANICAL DEVICES.

The distribution of the enormous output of documents is greatly facilitated by the use of mechanical devices for addressing and mailing. There were run off on the addressing machines during the year ended June 30, 1911, 6,468,463 addresses. This includes the envelopes or franks for the Monthly List, Crop Reporter, county correspondent and township correspondents, and lists of the Bureau of Statistics, as well as the various mailing lists of the other bureaus, divisions, and offices of the department. There are now maintained on the addressing system 792,035 addresses, as follows:

Bureau of Plant Industry	31,992
Bureau of Animal Industry, Dairy Division	272
Biological Survey	880
Bureau of Chemistry	6,759
Bureau of Entomology	553
Forest Service	340,582
Library	1,536
Office of Experiment Stations	16,818
Division of Publications	245,581
Office of Public Roads	4,253
Bureau of Soils	533
Bureau of Statistics	141,994
Solicitor's office	282
Total	792,035

The work of making removals and corrections on the various lists involves a great amount of careful and painstaking work; 86,161 stencils were cut out during the year. In addition to the cutting, arranging, and filing of stencils, 5,631,652 circulars, Monthly Lists, and Crop Reporters were folded on the folding machines; 756,676 congressional franks and 305,589 sheets of paper furnished by the various bureaus, divisions, and offices of the department were cut on the hand machine. There were prepared and reproduced on the duplicating machine 675 orders, circular letters, press notices, etc., aggregating 250,817 copies, and containing in all 311,000 different pages.

MISCELLANEOUS CORRESPONDENCE.

One of the most important branches of work is that of handling the great mass of miscellaneous applications from all parts of the country, of which 527,460 were received. The assorting and perusing of these requests and indicating the particular publications to be mailed in each case and the addressing of the envelopes are intrusted to a force thoroughly familiar with the publications of this and other departments, as well as those of the various experiment stations and State departments of agriculture. An effort is made to satisfy the public and at the same time prevent wasteful distribution of the department's documents. Applicants, however, frequently ask for from 20 to 100 different publications, but it is necessary to carefully select and send only a few which are believed to be of interest, as otherwise the distribution of publications would not be equitable, and the policy is to give every applicant a few publications rather than to furnish a large number of documents to a few applicants, and when the department's supply of a publication is exhausted, applicants are referred to the Superintendent of Documents, who, under the law of January 12, 1895, is authorized to sell them at a nominal price.

Franks were written for 33,228 Farmers' Bulletin orders received from other bureaus, divisions, and offices and filed in this office; 166,224 cards and letter forms were mailed explaining that it was impossible to furnish the publications requested by the applicants.

There was also maintained, in order to prevent duplication, an index of the persons who received the Yearbook of the department for 1909.

The number of applications for publications received is a reflex of the Monthly List and continues to increase steadily as the list grows, but during the past year the work has been kept up to date.

The distribution work of this office absolutely requires an increase of space, as at present, although the stock is arranged in as systematic and compact a way as possible, there is insufficient room for the proper storing and distribution of publications, it being necessary to store many miscellaneous publications at a great distance from the mailing room, thereby consuming a great deal of time that the employees might use in actually assembling the publications.

Even after complying literally with the recommendation of the Committee on Efficiency and Economy of this department by reducing the stock of publications which have been published two years or more to 25 copies, the natural increase of the publications of the department based upon the increase of last year will soon offset

the space thus gained and will not permit the expansion of the machine room, which is badly needed. At rush periods of work, for instance, when the Crop Reporter and Monthly List are being folded, envelopes for one or more large lists are being run off on the addressing machine, and press notices or circular letters are being produced on the duplicating machine, the members of the force are greatly handicapped by the insufficient space for proper storing of envelopes and publications incidental to their work.

WORK OF THE DIVISION FOR 1912.

The work during 1912 will be the same as heretofore, and an effort will be made to perform it more promptly and efficiently and to increase the division's helpfulness to the department and its usefulness to the public.

The division's expert knowledge in regard to printing and binding and to publication work generally will continue to be exercised to secure the largest and best results from the available appropriation.

The same careful attention will be given to the distribution of documents. From 2,500 to 3,500 applications for published information are daily received by this office. The selection of those that should be sent in order to give the applicant the desired information is one of the most important duties and responsibilities devolving upon the division. It is only by the exercise of discretion, based upon a familiarity with the subject matter, that an equitable and economical distribution of the department's publications is insured.

RECOMMENDATIONS FOR 1913.

The enormous volume of work devolving upon the division calls for the best efforts of the employees, and their fidelity and efficiency are to be commended. There should be a readjustment of salaries in order that all those rendering conspicuously efficient service may receive the compensation to which they are justly entitled. Both clerks and laborers are constantly leaving the division to accept better positions in other bureaus, divisions, and offices. Such changes interrupt the business of the office and detract from the availability of the force. This was apparent to the Committee on Efficiency and Economy, which, after careful investigation, strongly recommends a minimum salary of \$900 for all employees doing high-grade clerical work. There are some first-class stenographers receiving \$720 and \$840 per annum, and some clerks at the same salaries who should be promoted to \$900 and even \$1,000, and there are other efficient clerks whose work is of such character as to entitle them to \$1,400, and it is urgently recommended that this adjustment be made in order to place them on an equality with clerks doing similar work elsewhere in the department. The salaries of those employees whose duties are largely administrative or supervisory should be increased to \$1,600 or \$1,800.

The recommendation is renewed for an increase in the salaries of the assistant editors. The work performed by them is of the highest character, involving great responsibility and expert knowledge and experience, such as in a private reliable publishing house would command much higher compensation than they now receive, and in which there has been no increase for several years.

Two or three additional skilled laborers are urgently needed in connection with the distribution of documents. They should be provided at the earliest practicable date if the division is to maintain its present reputation for promptness in getting out the publications to the people.

USE OF OUR PUBLICATIONS BY SCHOOLS AND UNIVERSITIES.

The demand for the department's publications for use in schools of all grades and also from universities continues to increase and is far beyond our ability to supply. An effort is always made to furnish a limited number for this excellent use. Millions of publications, especially Farmers' Bulletins, could be placed in the hands of the youth of the country who are interested in agriculture and kindred subjects, and it is believed that such distribution of them would encourage agriculture and increase the prosperity of the Republic. An increase of the appropriation with this object in view is worthy of serious consideration.

PUBLICATIONS FOR RESTRICTED AREAS.

A study of the mass of correspondence daily received in this office shows there is an increasing demand for information relating to a particular locality or section of the country, which it is often difficult to supply because of the general character of many of our publications. The appropriation for Farmers' Bulletins provides for publications adapted to different sections of the country, and it is gratifying to state that many of the bulletins now submitted for publication have been prepared with the view to their distribution in a restricted section. If this were the established policy of the department the bulletins would prove more valuable, and there would be no waste which now results from sending out a bulletin general in scope and character, which is only partially applicable to a State or locality whence the request comes for information. It would be much more economical also to print brief bulletins for restricted areas.

A FARMERS' BULLETIN FOR EACH STATE.

During the last two years there has been an increasing demand for information in regard to the agricultural possibilities, physical characteristics, soils, etc., of the different States. The soil surveys give much of this information, but the editions are limited by law to 1,000 copies, and they are expensive. It is believed that a series of Farmers' Bulletins, one for each State, prepared in a very popular way, giving the information generally sought, would meet the popular demand to the best advantage. Such a series would be very popular and useful, and it is recommended that the subject receive careful consideration.

ABOUT 100-PAGE PUBLICATIONS.

Under the provisions of the printing bill now pending in Congress, it will be possible for the department to procure not exceeding 2,500 copies of any publication exceeding in size 100 octavo pages. For

years the department has been restricted to 1,000 copies of such publications, which number is insufficient to supply the regular lists, leaving none for general distribution. In many cases these bulletins have been of very great importance, and the inability to distribute them more generously has been a great hardship to the department, and the people have been deprived of valuable information. It is hoped the provision will prevail.

REMITTANCES FOR PUBLICATIONS.

Under the regulations, all money received by the various bureaus, divisions, and offices in payment for publications is turned over to this office for transmission to the Superintendent of Documents, who alone is authorized to sell Government publications. The amount of money received by the department has greatly decreased in the last year, and yet, notwithstanding the instructions printed on the Monthly List of Publications, money is occasionally forwarded to the department instead of to the Superintendent of Documents. If all money sent by mistake to the bureau in which the publication originated was promptly turned over to this office, the cause of the complaint of delay on the part of the remitters would be avoided.

INSUFFICIENT SUPPLY OF YEARBOOKS.

For several years the department's allotment of the Yearbook has been insufficient to supply its correspondents, especially those of the Bureau of Statistics. The reports of these voluntary correspondents are the original and most important basis of the department's crop reports. There is no compensation for this valuable service other than occasional publications of the department. They all want and should receive the Yearbook, but to supply them all would require 50,000 additional copies, or 80,000 for the use of the department. To secure this number an amendment to the law of January 12, 1895, would be necessary, and an increase of \$30,000 in the fund for printing and binding would be required. Such amendment and increase, if made, would undoubtedly inspire better service from the correspondents who could thereby be supplied with the publication.

INCONVENIENT AND CONGESTED OFFICE ROOMS.

Larger and more convenient quarters are urgently needed for the division. It ought to be housed in one fireproof building large enough to accommodate all the sections of the work. At present the main or administrative office is on the first floor of the old building; the editorial and indexing rooms on the second floor are too small; the rooms devoted to drafting and photography are on the fourth floor; while the distribution of the documents is made from a building two squares away. If all the work were concentrated in one building, erected for the special accommodation of the division, close supervision would be possible, time and labor now unavoidably wasted would be saved to the Government, and the business and efficiency of the division would be increased. It is earnestly hoped that such a separate building in which to house the division may be provided.

REPORT OF THE CHIEF OF THE BUREAU OF STATISTICS.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF STATISTICS,
Washington, D. C., September, 12, 1911.

SIR: I have the honor to submit herewith the report of the Bureau of Statistics for the fiscal year ended June 30, 1911.

Very respectfully,

VICTOR H. OLMSTED,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

INTRODUCTION.

The organization of the Bureau of Statistics during the year ended June 30, 1911, and the character of the work accomplished were the same as in the immediately preceding years, as fully described in the annual reports of this bureau. During the year, however, certain lines of work have been accomplished not varying in character but somewhat broader in scope than heretofore, as set forth in the statements which follow of work accomplished by the bureau and the different divisions thereof.

CROP-REPORTING SYSTEM.

An important feature was added to the crop-reporting system of the bureau, in accordance with the plan outlined in our report for last year, to wit, the quantitative interpretation of the figures indicating the condition of growing crops for which quantitative estimates are made at the close of each year. The significance of the condition figures from month to month of the growing crops involved have been shown by their translation or interpretation into figures indicating the yield of such crops as promised by the condition reports.

Before such official interpretations were made, the condition figures were subject, in past years, to many differing interpretations both by private and commercial interests, some of which were undoubtedly made for speculative purposes, the idea being to influence improperly the course of prices. Since the official interpretations have been made, during the past year, the private interpretations have practically ceased, those emanating from this bureau being accepted in practically all quarters as the fairest and most authentic figures possible to be based on the condition reports.

It should be said, in passing, that of the leading crops, for which quantitative interpretations of condition figures are made, all are

included except the cotton crop. In the case of cotton it is impossible to interpret the condition figures because of the fact that an important element, necessary to such interpretation, is lacking, to wit, the abandoned acreage of cotton. This can not be ascertained until the close of the season, and it has been found impracticable in its absence to translate, quantitatively, the figures showing the condition of the growing crop.

During the past year the chief of bureau was designated by the Honorable Secretary of State as a delegate to the General Assembly of the International Institute of Agriculture, which convened at Rome, Italy, on May 14, 1911. The results of the General Assembly are set forth in the report to the Department of State by the American delegates, and it is therefore believed unnecessary to go into this matter at this time.

The chief of bureau was directed by the Secretary of Agriculture to visit various countries in Europe at the conclusion of his duties at Rome for the purpose of securing information which it was believed would be of value to our crop-reporting service.

The data gathered in the few countries visited before returning to Washington were of a negative character, but are fully as valuable as though they had been positive in their nature, inasmuch as they show, beyond doubt, that the crop-reporting systems of the European countries visited contained no features or covered no range better or broader than embraced by our system; in fact, it was found that, as far as the investigation extended, the system prevailing in the Department of Agriculture of the United States, which has been in operation many years, is far in advance of that of any other country.

ORGANIZATION.

During and at the close of the fiscal year the bureau consisted of three principal divisions, in Washington, in addition to the offices of the Statistician and of the chief clerk, to wit, the Division of Domestic Crop Reports, the Division of Production and Distribution, and the Division of Research and Reference (formerly known as the Editorial Division and Library).

The service outside of Washington embraces a State statistical agent in each State, and a force of special field agents, the number of State statistical agents at the close of the year having been 46, and the special field agents numbering 18. Since the close of the fiscal year a small addition to the appropriation for the bureau by the last Congress has enabled the appointment of one additional State statistical agent in Arizona, and two additional special field agents. The latter two appointments have enabled us to make a new subdivision of territory in certain sections where that covered by special field agents during the past fiscal year was too large for them to report upon adequately.

As to the organization of the work outside of Washington it may be said, briefly, that each State statistical agent maintains a corps of voluntary unpaid correspondents throughout his State, who report to him monthly regarding the acreage, condition, or yield of crops dealt with, or the number, status, and value of farm animals. Based on the reports received by him and on his own personal knowledge and observation gained through a limited amount of travel (limited because available funds will not permit extensive travel) he renders

a report to this bureau at the close of each month upon the topics handled during each of the specific months to which his reports relate. These State statistical agents are paid small salaries, and are only required to devote so much of their time to the work as is necessary for its proper performance. Their duties demand and they ought to be paid larger compensation.

The special field agents are assigned to two or more States each and devote their entire time to the work. They travel within and throughout their respective territories gathering information from all dependable sources. They interview country merchants, implement dealers, country bankers, farmers, and all others in touch with or likely to have a knowledge of agricultural conditions. They are required to visit the growing crops in the fields and make personal inspection of their appearance and condition. Each of them has correspondents located in various sections of his territory who report to him at the close of each month from those parts of his district which he is unable to visit. Based on the knowledge thus gained, through personal inspection and interviews, and on the information derived from their correspondents, the special field agents make reports monthly to the bureau, similar to the reports made by the State statistical agents.

Reports both of the State statistical agents and special field agents regarding what are known as "speculative" crops (corn, wheat, oats, and cotton) are sent direct to the Secretary of Agriculture and are held by him in a locked receptacle until the morning of the day on which each crop report is to be issued, when they are delivered to the Statistician for tabulation and computation.

During the past year the work of inspecting and instructing the forces of State statistical agents and special field agents of the bureau has been carried on vigorously, with great benefit to the service. The assistant statistician of the bureau has been placed in charge of this branch of the work; his report is given further on.

In addition to the sources of information enumerated above, the bureau has various lists of correspondents who report direct to Washington each month, the information they furnish being along lines identical with those covered by the State statistical agents and the special field agents. These correspondents are located in every agricultural county and township in the United States. They are divided into various classes, the reports of each class being tabulated separately and independently from every other class in the Division of Domestic Crop Reports, a report of the work of which during the past fiscal year follows.

The methods and processes pursued in tabulating, computing, and arriving at the figures covered by the monthly crop reports of the bureau have been so fully described, in such great detail, both in reports of this bureau heretofore made and in the public press, that it is considered wholly unnecessary to set forth here what has been so frequently and elaborately explained.

An appreciable portion of the time of employees of the bureau is consumed in the preparation of replies to letters of inquiry regarding agricultural statistics as well as other statistics bearing upon agriculture. These inquiries are received from all classes of citizens, including professors in agricultural colleges, State officials, depart-

mental officials, Senators, Representatives, and others. As indicating the volume of this class of work it may be said that the records show 7,974 letters to have been press copied and mailed during the past fiscal year.

The bureau also does considerable work along statistical lines in the way of computing and tabulating for other bureaus and offices of the Department of Agriculture. A record has been kept of the time devoted to such work and the cost of the same. For the past fiscal year the value of services of clerks while employed upon work for other bureaus and divisions of the Department of Agriculture amounted to \$3,886.

NEW FEATURES IN CROP REPORTER.

In addition to the usual monthly crop reports, which appear regularly in the Crop Reporter, several new features have been added.

In the August, 1910, Crop Reporter was published statistics of the values of lands, by States, upon which corn and wheat are grown, and the average size of fields. This report shows that the average value of wheat-growing lands in the United States in 1909 was \$44 per acre, being lowest in Alabama (\$16) and highest in Illinois (\$84). Corn lands averaged in value \$48 per acre, being lowest in Florida (\$11) and highest in Illinois (\$100) per acre. The average size of fields varies considerably in the different States. The average corn-field is 31 acres in size, but only 3 acres in Vermont and Rhode Island and 55 acres in Nebraska. The average wheat field is 54 acres, but only 3 acres in Vermont, whereas it is 169 acres in California.

A report upon the average wages paid to farm labor will be made annually hereafter. A statement appeared in the March, 1911, Crop Reporter of the wages paid in 1910. The average monthly wage for farm labor, without board, was found to be about \$27.50, as compared with \$22.14 in 1902, when the last preceding investigation was made; in the eight years there was an increase of about 24.2 per cent.

The result of the investigation upon the cost of producing corn in 1909 was published in the April, 1911, Crop Reporter; the results for wheat in the May number, and the results for oats in the June number. This investigation made it evident that the cost of producing crops varies widely in different sections of the United States. The average cost per bushel of producing corn in the United States was found to be 37.9 cents (including rent charge), varying by States, from 30 cents in Iowa and South Dakota to 72 cents per bushel in Maine; the average cost of producing wheat in the United States, 66 cents per bushel (including rental charge), varying by States from 44 cents in Montana to 96 cents per bushel in South Carolina; the average cost of producing oats in the United States, 31 cents per bushel (including rental charge), varying by States from 23 cents per bushel in Montana to 56 cents in Connecticut. This line of investigation concerning the cost of producing crops will probably be continued.

In the Crop Reporter for November, 1910, appeared a summary of the first investigation of the amount of damage done to each important crop in 1909, and the relative extent of each cause of damage. A similar inquiry has been made for 1910, and will probably be continued hereafter. The results of this first inquiry show that, of the

total damage done to field crops in 1909, about 81.8 per cent is attributed to unfavorable climatic conditions, 4.8 per cent to plant diseases, 7.9 per cent to insect pests, 1 per cent to animal pests, 1 per cent to defective seed, and 3.5 per cent to unknown causes.

A new feature has been added to the data given in the Crop Reporter, in a monthly presentation of average temperature and precipitation by States. The figures are furnished by the Weather Bureau of the Department of Agriculture.

Of other special reports, or results of investigations, appearing in the Crop Reporter during the past year may be mentioned the following:

"Stocks of potatoes on January 1," appearing in January, 1911; "Monthly marketings of principal grain crops," February, 1911; "Rice varieties in the United States," October, 1910; "Average farm prices of horses and cattle, 1867-1911, in the United States, by

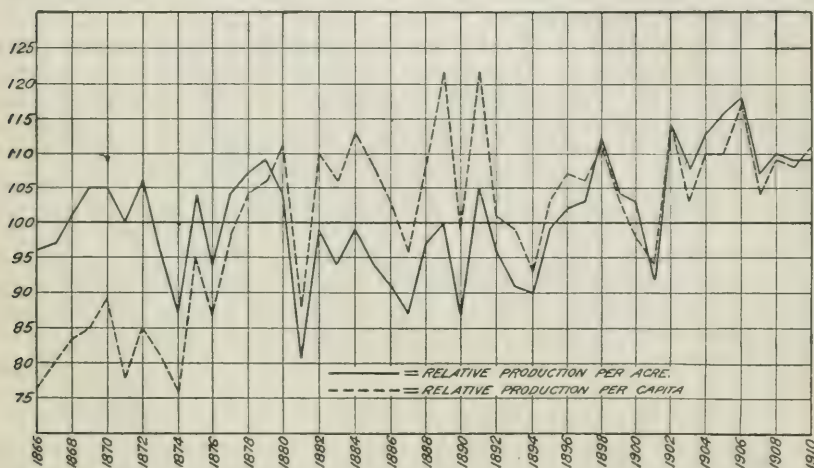


Chart showing relative production per acre and per capita in the United States of ten crops (wheat, corn, oats, barley, buckwheat, rye, potatoes, hay, tobacco, and cotton) combined. 100 represents the average for the 43 years 1866-1908.

ages," February, 1911; "Index figures of yield per acre, per capita production, and December 1 farm price of 10 products combined, yearly since 1866" (see chart), March, 1911; "Production of important crops in the leading five States, 1906-1910," March, 1911; "Cotton production comparisons," April, 1911; "Value of wealth produced on farms annually," May, 1911.

WORK OF THE ASSISTANT STATISTICIAN.

The assistant statistician is particularly concerned with the inspection, supervision, and instruction of the field service of the bureau. This is a vitally necessary work, because upon the efficiency of these agents, as reflected in their reports to the bureau, depends largely the accuracy of the Government crop reports.

For several years it has been impossible to give proper supervision to the field force because of the absence, first, of the Statistician and later of the Associate Statistician on foreign duty.

During the fiscal year just closed it has been possible to have each agent visited, his work inspected, and needed instructions given him at least once and a part of them twice, with resulting benefit to the work.

In addition to his work in the field, the assistant statistician has been engaged in general administrative work in the bureau, in cooperating with the department's committee on economy and efficiency, and in the preparation of a manual of instructions for the guidance of the bureau's army of voluntary crop correspondents. He has also revised and amplified the bureau's instructions to special field agents and State statistical agents, embodying full and detailed directions regarding the recently inaugurated system of weighting, designated to determine the relative influence upon State averages of conditions existing in the separate agricultural districts of each State.

This new system of weighting, with improved and simplified methods of editing and computing the results of their investigations and inquiries, is placing the entire field service upon a more satisfactory and scientific basis.

The State statistical agent's unit for weighting purposes has hitherto been the county. This unit is to be abandoned and each State divided into districts, usually embracing several counties having similar soil, climate, products, etc.

This change with other improvements will eliminate much of the purely clerical labor formerly devolving upon the State statistical agent during the preparation of his estimates and give him more time to consider and render due weight to the different factors involved, thus insuring greater accuracy in his final conclusions.

The same system will be extended to the work of all special field agents, its practicability and value in their work having been already fully demonstrated, thus placing the work of the entire field service upon a uniform basis, a most important consideration in statistical work.

The census figures on acreage and production, now rapidly becoming available, will assist greatly in determining upon accurate weights for States and districts, a matter of vital importance under the new system.

WORK OF THE OFFICE OF THE CHIEF CLERK

The work of the office of the chief clerk during the fiscal year ended June 30, 1911, as in past years, related to the general supervision of the work and personnel of the clerical force, messengers, and other employees; maintenance of the bureau's financial and property accounts; purchase, custody, and distribution of supplies; preparation of salary rolls and vouchers; administrative audit of expense accounts; copy duplicating work; dispatch of outgoing mail, and correspondence concerning the foregoing. This work was kept uniformly up to date.

During the year several improvements were effected which have promoted the efficiency of the bureau as a whole, among which may be mentioned:

Extensive alterations in the interior office arrangements, affording additional space for the Divisions of Domestic Crop Reports and of Research and Reference and enabling the latter to concentrate in its library section all volumes, documents, and pamphlets in the custody

of the division. Additional desk room and a more effective distribution of the force of these two divisions was also obtained. To accomplish these results it was necessary to floor in the space between the east galleries, connecting the east and south galleries, and extend the west gallery.

The files of the bureau have been segregated and located in a separate file room and their capacity increased. About 20,000 communications were filed during the year. The extremely valuable records and files of the bureau have been examined and placed in proper order.

Communication between the various offices and divisions of the bureau has been greatly facilitated, and much time saved, through the installation of an automatic interior system of telephones.

An addressing machine was installed in the Post Office Department under an arrangement by which this bureau is enabled to utilize that department's stencil list of about 50,000 post offices for the purpose of addressing post cards, formerly addressed monthly or more often, by hand, which contain summaries of Government crop reports, to be posted for the information of the public.

Two old, hand-power multigraph machines have been replaced by modern electric-driven machines with improved paper-feed attachments. The capacity of these machines is such that it has been possible to increase largely the amount of duplicating work done for the bureau. Fifteen hundred copies of the summary of the Government's monthly crop report can be made on these machines within less than an hour after the report is issued.

Fifteen modern sectional filing cabinets were furnished to agents of the bureau in the field, to assist them in the systematic handling and filing of their official correspondence, data, and records.

A new system of time records has been inaugurated by direction of the Secretary of Agriculture, the same system being installed simultaneously in all bureaus and offices of the department.

WORK OF THE DIVISION OF DOMESTIC CROP REPORTS.

The Division of Domestic Crop Reports tabulates and computes the many thousand reports received monthly from the voluntary correspondents of the bureau; in addition, the lists of correspondents are maintained in this division—a work of no small magnitude—and necessary correspondence with them is carried on. All schedules received from correspondents are here opened and distributed to the tabulating clerks, frequently requiring temporary assistance from the other divisions of the bureau.

The total number of questions asked of correspondents of all classes in 1905 was 483; in 1910 it had increased to 2,582, or 435 per cent.

Separating the inquiries into two classes, those chargeable to "crop report" and those chargeable to "special investigations," it appears that special investigations have wholly developed since 1905, there being none of record during that year, and but one of 45 inquiries in 1906, one of 13 inquiries in 1907, and one of 48 inquiries in 1908, while there were eight investigations, including 559 inquiries, in 1909, and nine investigations, comprising 579 inquiries, in 1910.

The inquiries chargeable to "crop report" increased during the period from 483 in 1905 to 2,003 in 1910, or 315 per cent.

The following table shows the number of inquiries made yearly during the period:

Number of different inquiries made by the Bureau of Statistics, 1905-1910, inclusive.

	1905	1906	1907	1908	1909	1910	Per cent of Increase over 1905.
Crop report.....	483	723	1,087	1,316	1,440	2,003	315
Special investigations.....		45	13	48	559	579	.....
Total.....	483	768	1,100	1,364	1,999	2,582	435

Taking the township list of crop correspondents as an example, it appears that comparing 1905 with 1910 there was an increase of 95 per cent in the number of questions comprised on the schedule, and an average increase of 38 per cent in the number of correspondents returning the schedules to this office monthly.

Percentage of the total number of schedules mailed to township correspondents which was returned, 1905-1910, inclusive.

	1905	1906	1907	1908	1909	1910
Percent of township reports received.....	49.4	48.5	54.7	63.1	66.9	66.5

This large increase in the work of the division is further shown by the number of replies returned by township correspondents and tabulated, as follows:

Total number of entries tabulated from township correspondents' reports, 1905-1910, inclusive.

Year.	Number of inquiries.	Per cent.
1905 ¹	692,000	100
1906 ^{1,2}	1,272,000	155
1907 ¹	1,612,000	232
1908 ³	2,063,000	298
1909 ³	2,258,000	326
1910 ³	2,427,000	351

¹ Estimated, using 1908 as base.

² Supplemental schedule of minor crops, first issued in June, 1906.

³ Actual count of inquiries returned.

In December, 1909, a notable addition was made to the monthly reports of this bureau in the addition of a special list of buyers of farm products. A schedule comprising 30 of the principal products of the farm, other than corn, wheat, oats, barley, rye, buckwheat, potatoes, flaxseed, hay, cotton, butter, eggs, and chickens, the prices of which are secured monthly from county correspondents, is sent out and made returnable on the 15th day of each month, the labor in connection therewith devolving upon the Division of Domestic Crop Reports.

This large increase in the work specified above has been accompanied by a similar increase on the county schedule, to which have

also been added the prices of the 13 products referred to in the preceding paragraph, and in all tributary branches of the work. The maintenance of lists of crop correspondents has been systematized; and, as shown above for the list of township correspondents, a large improvement has resulted; and the improvement relates not only to the number of reports returned, but to the careful distribution of the correspondents, increased tenure of service, and the consequent increased reliability of the reports returned. A number of special lists of correspondents have been secured, as dealers in live stock, grain, tobacco, apples, and potatoes. A list of veterinary surgeons has also been secured with reference to obtaining expert opinion regarding the condition, mortality, etc., of live stock; also, as above mentioned, a list of buyers of farm products to supplement the information regarding prices obtained monthly from producers. The care and maintenance of these lists entail a large increase in the amount of time devoted to such work. A further large increase in the dispatch and receipt of mail (about 1,000,000 pieces are sent out annually) and in general statistical work has occurred.

Notwithstanding the large increase in the work of the division, outlined above, it has been able to perform an increasing amount of work for other divisions of the bureau. In 1907 but 2.7 per cent of its time was charged to work performed for other divisions; 11.1 per cent in 1908; 17 per cent in 1909; and in 1910, 22.5 per cent of its time was so employed.

The monthly tabulation sheets are now handed to the Statistician from two to three days earlier than in 1905.

It is further to be noted that while the work of the division chargeable to "crop report" has heavily increased during this period, the percentage of the time of the division charged to "crop report" decreased from 96.1 per cent in 1907 to 76.7 per cent in 1910, and the average number of clerks employed on the work from 38 in the fiscal year 1906-7 to 34 in the fiscal year 1910-11.

WORK OF THE DIVISION OF PRODUCTION AND DISTRIBUTION.

PRODUCERS' AND CONSUMERS' PRICES OF FARM PRODUCTS.

In the Division of Production and Distribution an investigation that caused much discussion throughout the country was concerned with the prices of farm products. In the case of each product, the price received by farmers was compared with that paid by consumers. Two aspects were presented—the farmers' share of consumers' prices, and consumers' price as an increase of farmers' price. An immense relative increase in the prices of farm products between farmers and consumers was discovered, and the excessive costliness of the distributive system was indicated.

AGRICULTURAL PRODUCTION AND POPULATION.

The high prices of many farm products during the few years preceding 1911 had given ground for the popular inference that the agriculture of this country was unequal to the needs of the increasing population. Investigation of the facts with regard to this feature was made, without ascertaining any causes for alarm. On the contrary, it was evident that this country has been and is passing through

phases of agriculture that are familiar to persons who are well informed, in which declines in production per acre are the result of exploiting new land and in which recuperation follows with a pace greater than that of increase of population.

SEEDTIME AND HARVEST

Work was continued in the investigation of the dates of planting and harvesting in the United States and in foreign countries, with the prospect of completion during the following fiscal year. This group of projects has four subdivisions: (1) Cereal crops, flax, cotton, and tobacco; (2) forage crops; (3) truck crops; and (4) seedtime and harvest in foreign countries. This is an unusually large undertaking, and is of the pioneer sort. The plans of work have been original, and the processes of treating the primary materials for the purpose of arriving at conclusions have had many practical problems to solve.

MARKETING ON THE PACIFIC COAST.

The manuscript for a bulletin relating to marketing grain and live stock in the Pacific coast region was completed and sent to press before the close of the fiscal year. The chief object of this investigation was to show conditions affecting the cost of selling and delivering grain and live stock from farm to consumer, and to make note of changes which occurred in these conditions in the past 30 years.

EGGS, POULTRY, AND APPLES.

A comparative statement of monthly receipt of eggs and live poultry has been compiled each month and published in the Crop Reporter. This statement shows the relative increase or decrease from month to month in the quantities received by large dealers who buy from the country, and in the receipts at important markets.

Preliminary work has been done toward compiling a statement of the quantity of apples shipped from the principal producing regions for the crop of 1911. If this attempt is successful, it is intended to continue these statements from year to year.

THE RAILROADS AND AGRICULTURE.

Just prior to the close of the fiscal year two investigations were begun. One relates to the development of agriculture in the United States, as influenced by transportation companies, with especial reference to such topics as the movement of agricultural population and the occupation of railroad lands. The other new investigation relates to changes in the cost of distributing perishable farm products.

COLD STORAGE AND PRICES.

Work was begun in this division with regard to the effects of the cold storage of foods on marketings and prices. The problems presented for examination were to ascertain the length of time in storage; effects of storage on prices; whether storage tends to equalize prices throughout the year; whether it raises the general level of prices; to what extent it raises prices in seasons of plentiful production and

lowers them in seasons of scant production; whether the annual carry-over influences the prices of the marketings of the production of the following year.

FRUITS AND NUTS.

In the interest of the citrus fruit growers, this division entered into a thorough examination of the surplus production of citrus fruits and their products in foreign countries, and of the destination of the exports. Upon the completion of this work, similar investigation was directed to other fruits and to nuts—an undertaking that is yet to be completed. Accessory to the foregoing was an inquiry concerning the freight rates for the transportation of citrus fruits in Europe. Connected with this undertaking is a compilation of the exports and imports of fruit and nuts in the foreign trade of the United States, with specification of countries to and from which consigned.

OTHER SUBJECTS OF INVESTIGATION.

Other subjects of work have been pursued by this division when time has permitted, and among these are a compilation of the prices of farm products as far back in time as sources of information can be found; the production, foreign trade, and consumption of farm products from the earliest available date to the present; the revision of the more important and permanent bulletins prepared in this division and their extension to present time. The resources of this division have been so largely employed during the year in official services for providing information to Senators and Representatives in Congress that other special investigations have been somewhat delayed.

WORK OF THE DIVISION OF RESEARCH AND REFERENCE.

The division heretofore named the Editorial Division and Library has, for formal reasons, been changed in designation to the Division of Research and Reference. Its functions, however, have remained practically the same, and consist of: (1) Reading and revising all manuscript prepared in the bureau for printing; (2) compiling, reducing to equivalents in United States units and coordinating, for publication in the Yearbook, the official statistics of foreign governments on the area and production of certain crops; (3) the preparation of reports, for publication in the Crop Reporter and in monthly circulars, respecting agricultural conditions in foreign countries, special attention being paid to the increase or decrease of areas under the principal crops, their condition of growth and healthfulness at regular intervals, yields when harvested, foreign trade, etc.; (4) the assembling of statistical and other data and the composition of text for bulletins and circulars; (5) the compilation of statistics from records of the Treasury Department relative to the domestic production of tobacco and the consumption of hops by domestic brewers; (6) the preparation of answers to requests received by the bureau from other departments, other bureaus of the department, statesmen, economists, statisticians, educators, commercial exchanges, and business men, for statistics relating to agricultural, commercial, economic, and other subjects; (7) translations from foreign languages for the use

of the bureau, and, when requested, for other branches of the department; (8) the management and care of the bureau's statistical library, including the maintenance of a card catalogue of the agricultural statistics contained therein; (9) stenography and typewriting for the bureau and occasionally for other bureaus of the department.

The manuscript of 9 bulletins, 2 circulars, and 12 monthly editions of the *Crop Reporter* have been reviewed, either wholly or in part, in the division during the year. Of the bulletins, 6 were prepared in other branches of the bureau; the data for 3 bulletins and 2 circulars were assembled and the writing thereof done in this division. The present status of this feature of the division's work is that 7 bulletins are in press and 2 in process of review; the 2 circulars have been published.

Of the bulletins prepared in the division during the year, one, entitled "Russian Cereal Crops, area and production by governments and provinces," is in press; two, entitled "The World Production, Trade, and Consumption of Coffee," and "The World Production, Distribution, and Trade in Coconuts," are in process of review, the work having been delayed by a lack of sufficient assistance.

The remaining work of the division has varied little from the usual routine; the usual statistical tables have been compiled for publication in the *Yearbook*, showing, by countries, the reported world area and production of corn, wheat, oats, barley, rye, and flaxseed, and the production of coffee; by courtesy of the Office of the Commissioner of Internal Revenue comprehensive statements have been tabulated relative to the sales of tobacco by domestic growers and the consumption of hops by domestic brewers, the former for use in the bureau in connection with its estimates on tobacco production, and the latter for publication in the *Crop Reporter*; among the most important functions of the division has been extensive research into foreign and domestic official and unofficial publications for diverse statistical data relative to areas, yields, commerce, prices, etc., of agricultural products in the United States and foreign countries, this information being for the most part required in preparing answers to the voluminous requests made upon this bureau by legislators, professional and business men for data of this character.

Constant improvement is being made in the management of the library. The actual number of bound and unbound volumes contained therein June, 1911, was 8,034, and pamphlets, 1,283. The number of daily domestic and foreign publications received is 43, monthly 70, weekly 78, and quarterly 23.

FARM VALUES AND PURCHASING POWER OF FARM PRODUCTS.

In my report of 1910 I showed that the value of 1 acre of the farmer's crops in 1909 was 72.7 per cent more than in 1899; that the cost of articles purchased by farmers had increased about 12.1 per cent; and, consequently, the purchasing power of the produce of 1 acre in 1909 was about 54 per cent greater than the purchasing power of the produce of 1 acre in 1899.

This statement is in harmony with reports recently issued by the census relating to farm values; according to census reports land values have increased 109 per cent from 1900 to 1910, as is shown in the comparative table on page 15.

General farm data, 1890, 1900, and 1910.

	1910	1900	1890	Increase 1910 over 1900.	Increase 1900 over 1890.
Number of farms.....	6,340,357	5,737,000	4,565,000	<i>Per cent.</i> 11	<i>Per cent.</i> 26
Total acres in farms.....	873,729,000	838,592,000	623,219,000	4	35
Improved acres in farms.....	477,448,000	414,498,000	357,617,000	15	16
Value of land in farms.....	\$28,386,770,000	\$13,058,008,000	\$13,279,253,000	{ 117 }	{ 25 }
Value of buildings on farms.....	\$6,294,737,000	\$3,556,639,000			
Value of implements and machinery on farms.....	\$1,262,022,000	\$749,776,000			
Value per acre of land and buildings.....	\$39.69	\$19.81	\$21.31	68	52
Value per acre of land alone.....	\$32.49	\$15.57	.....	100	17
				109	.....

¹ Decrease.

The census of 1910 was taken at a time when farmers were in the zenith of their prosperity. For several years preceding crops were good and sold well. This is shown in the following table, which gives the average value per acre yearly since 1866 of 10 crops combined

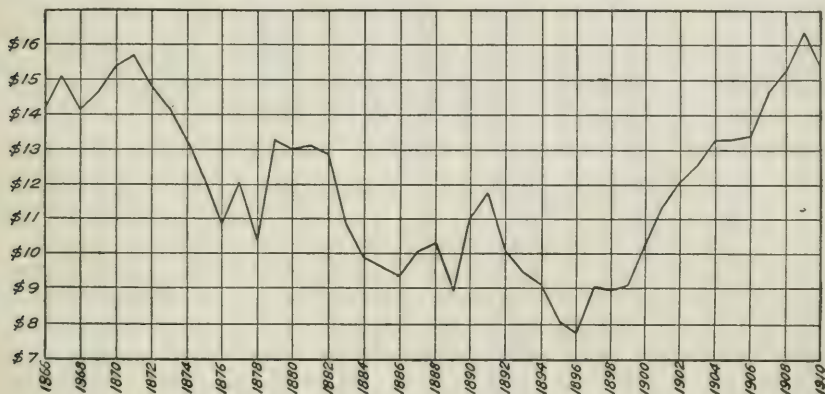


Chart showing value of the produce of 1 acre (wheat, corn, oats, barley, rye, buckwheat, potatoes, tobacco, hay, and cotton) combined, for 95 per cent of area of full crops.

(wheat, corn, oats, barley, rye, buckwheat, potatoes, hay, cotton, tobacco); they include about 95 per cent of the total crop area of the United States, and closely approximate the average value of all crops.

Yearly value per acre of 10 crops combined.

1910.....	\$15.49	1898.....	\$9.00	1886.....	\$9.41	1874.....	\$13.25
1909.....	16.42	1897.....	9.07	1885.....	9.72	1873.....	14.19
1908.....	15.32	1896.....	7.94	1884.....	9.95	1872.....	14.86
1907.....	14.74	1895.....	8.12	1883.....	10.93	1871.....	15.74
1906.....	13.46	1894.....	9.06	1882.....	12.93	1870.....	15.40
1905.....	13.28	1893.....	9.50	1881.....	13.10	1869.....	14.67
1904.....	13.26	1892.....	10.10	1880.....	13.01	1868.....	14.17
1903.....	12.62	1891.....	11.76	1879.....	13.26	1867.....	15.09
1902.....	12.07	1890.....	11.03	1878.....	10.37	1866.....	14.17
1901.....	11.43	1889.....	8.99	1877.....	12.01		
1900.....	10.31	1888.....	10.30	1876.....	10.80		
1899.....	9.13	1887.....	10.14	1875.....	12.20		

(See also chart above.)

The above table shows that from the year of greatest depression, 1896, to 1909, there was a practically constant yearly increase in value of the output of an acre of produce, the total increased from \$7.94 to \$16.42, being nearly 107 per cent. In 1910 there was the first reduction from the preceding year since 1898—a reduction from \$16.42 per acre to \$15.49, equivalent to 5.7 per cent; however, values per acre in 1910 were 69.7 per cent higher than in the census year of 1899. The following table shows acreage, yield, and value of specified crops in 1910, 1909, and 1899:

Acreage, yield, and value of specified crops in 1910, 1909, and 1899.

Crops.	Acres (000 omitted).			Yield per acre. ¹		
	1910	1909	1899	1910	1909	1899
Corn.....	114,002	108,771	94,914	27.4	25.5	28.1
Wheat.....	49,205	46,723	52,559	14.1	15.8	12.5
Oats.....	35,288	33,204	29,540	31.9	30.3	31.9
Barley.....	7,257	7,011	4,470	22.4	24.3	26.8
Rye.....	2,028	2,006	2,054	16.3	16.1	12.4
Buckwheat.....	826	834	807	20.9	20.9	13.9
Potatoes.....	3,591	3,525	2,939	94.4	106.8	93.0
Hay.....	45,691	45,744	61,691	1.33	1.42	1.4
Tobacco.....	1,234	1,180	1,101	797.8	804.3	788.2
Cotton.....	32,403	30,938	24,275	170.7	154.3	184.0
Total.....	291,523	279,936	274,380	.....	.....	.....

Crops.	Farm price per unit, December 1—			Farm value per acre, December 1—			Per cent increase or decrease in value 1910, compared with—	
	1910	1909	1899	1910	1909	1899	1909	1899
	<i>Cts.</i>	<i>Cts.</i>	<i>Cts.</i>					
Corn.....	48.8	59.6	30.3	\$13.37	\$15.20	\$8.51	-12.0	+57.1
Wheat.....	89.4	99.0	58.4	12.63	15.62	7.30	-19.1	+73.0
Oats.....	34.1	40.5	24.9	10.90	12.29	7.94	-11.3	+37.3
Barley.....	57.8	55.2	40.3	12.92	13.40	10.80	- 3.6	+19.6
Rye.....	72.2	73.9	51.0	11.76	11.87	6.32	- .9	+86.1
Buckwheat.....	65.7	69.9	55.7	13.71	14.61	7.74	- 6.2	+77.1
Potatoes.....	55.5	54.9	39.0	52.35	58.59	36.27	-10.7	+44.3
Hay.....	1,226.0	1,062.0	727.0	16.37	15.07	10.18	+ 8.6	+60.8
Tobacco.....	9.3	10.1	6.6	74.13	81.23	52.02	- 8.7	+42.5
Cotton.....	14.2	13.9	7.24	\$25.32	\$22.06	\$13.32	+14.8	+90.1
Average.....	.....	.....	.....	15.47	16.42	9.51	- 5.8	+62.7

¹ Hay in tons, tobacco and cotton in pounds, other crops in bushels.

² Average for season.

The statistics given above show that the value of 1 acre of the farmer's crops in 1910 was about 5.8 per cent less than in 1909, but 62.7 per cent more than in 1899.

An extensive inquiry has been made by the Bureau of Statistics among retail dealers doing business with farmers relating to prices paid by farmers for articles usually purchased by them. From this inquiry it appears that most articles purchased by farmers cost more in 1910 than in 1909, the average increase being about 1.5 per cent. Therefore the purchasing power of produce of 1 acre in 1910 was about 7.3 per cent less than in 1909, but still about 44.1 per cent more than in 1899. The purchasing power of an acre of corn in 1910 was about 13.3 per cent less than in 1909 and 39.2 per cent more

than in 1899; the purchasing power of an acre of wheat in 1910 was about 20.2 per cent less than in 1909 and 53.2 more than in 1899; and the purchasing power of an acre of cotton in 1910 about 9.5 per cent more than in 1909 and 44.1 per cent more than in 1899.

Detailed statistics follow:

Comparative prices of articles purchased by farmers in 1910, 1909, and 1899.

Articles.	1910	1909	1899	Percent- age 1910 to 1909.	Percent- age 1909 to 1899.
Coal oil, gallon.....	cents. 13.0	14.2	15.1	91.5	93.9
Coffee, pound.....	do. 22.5	18.9	17.2	119.0	109.8
Flour, barrel.....	dollars. 5.9	6.3	4.76	94.0	132.4
Lard, pound.....	cents. 16.0	15.7	10.3	102.0	151.5
Matches, box.....	do. 5.64	5.0	5.0	100.0	100.0
Salt, barrel.....	dollars. 1.62	1.6	1.39	101.1	114.9
Soap, cake.....	cents. 4.26	4.19	3.99	101.7	105.0
Starch, pound.....	do. 7.4	7.4	7.2	100.0	102.8
Sugar, pound.....	do. 5.64	5.73	5.27	98.5	108.7
Tobacco, plug, pound.....	do. 45.8	45.0	41.7	101.8	108.0
Brooms, each.....	do. 52.9	44.0	28.6	120.2	153.8
Dish pans, each.....	do. 31.0	31.2	28.7	99.5	108.7
Dinner plates, set.....	do. 70.0	71.5	67.8	98.6	105.4
Fruit jars, dozen.....	do. 78.4	78.4	72.8	100.0	107.7
Kitchen chairs, each.....	do. 82.1	81.6	72.3	100.6	112.9
Lamps, each.....	do. 48.2	46.0	46.0	100.0	104.8
Stoves, each.....	dollars. 22.3	21.8	19.7	102.2	110.7
Tin pails, each.....	cents. 24.5	24.4	23.0	100.3	106.1
Wooden buckets, each.....	do. 28.0	27.2	22.6	103.0	120.4
Wooden washtubs, each.....	do. 85.2	82.6	70.4	103.2	117.3
Gloves, pair.....	do. 85.4	84.4	71.6	101.2	117.9
Hats, each.....	dollars. 1.90	1.88	1.67	101.0	112.6
Jumpers, each.....	cents. 78.5	74.0	61.4	106.1	120.5
Overalls, each.....	do. 84.6	80.6	65.6	105.0	122.9
Raincoats, each.....	dollars. 4.05	3.97	3.32	102.0	119.6
Rubber boots, pair.....	do. 4.57	4.18	3.24	109.3	129.0
Shirts, flannel, each.....	do. 1.45	1.44	1.21	100.8	119.0
Shoes, brogan, pair.....	do. 1.99	1.94	1.48	102.5	131.1
Calico, yard.....	cents. 6.8	6.6	5.2	102.5	126.9
Muslin, yard.....	do. 9.4	9.0	7.2	104.6	125.0
Sheeting, yard.....	do. 19.4	18.2	14.3	106.5	127.3
Axes, each.....	do. 88.8	89.8	82.6	98.9	108.7
Barb wire, 100 pounds.....	dollars. 3.15	3.16	2.96	99.7	106.8
Dungforks, each.....	cents. 71.3	69.0	62.0	103.3	111.3
Hatchets, each.....	do. 59.3	59.0	53.8	100.5	109.7
Lanterns, each.....	do. 73.2	77.0	72.4	95.0	106.4
Nails, 100 pounds.....	dollars. 3.13	3.15	2.98	99.4	105.7
Pitchforks, each.....	cents. 58.4	56.8	50.8	102.8	111.8
Pincers, each.....	do. 44.1	44.2	41.6	99.8	106.2
Saws, buck, each.....	do. 77.2	76.8	71.0	100.5	108.2
Screw hooks, box.....	do. 32.7	33.2	31.6	98.5	105.1
Screw eyes, box.....	do. 32.1	32.4	31.0	99.0	104.5
Shotguns, each.....	dollars. 11.3	11.3	12.3	100.0	91.9
Steel traps, each.....	cents. 27.4	27.6	24.6	99.2	112.2
Shovels, each.....	do. 77.6	76.8	70.0	101.0	109.7
Staples, 100 pounds.....	dollars. 3.73	3.81	3.51	98.0	108.5
Steel wire, 100 pounds.....	do. 3.71	3.76	3.57	98.7	105.3
Wire fence, rod.....	cents. 35.7	36.0	34.1	99.0	105.6
Axle grease, box.....	do. 10.1	10.0	9.6	101.0	104.2
Buggies, each.....	dollars. 78.6	76.8	70.3	102.4	109.2
Buggy whips, each.....	cents. 42.3	42.1	39.8	100.4	105.8
Corn cutters, each.....	do. 27.8	27.3	25.0	102.0	109.2
Churns, each.....	dollars. 1.04	1.04	.92	100.2	112.6
Cream separators, each.....	do. 58.01	59.19	64.95	98.0	91.1
Grindstones, each.....	do. 3.87	3.78	3.44	102.5	109.9
Halters, each.....	cents. 73.4	70.6	63.0	103.9	112.1
Harness, single set.....	dollars. 18.48	18.21	15.21	101.5	119.7
Horse blankets, each.....	do. 1.79	1.7	1.58	101.2	112.0
Hoes, each.....	cents. 45.9	44.8	38.8	102.5	115.5
Harrows, ordinary, each.....	dollars. 10.54	10.49	9.27	100.5	113.2
Manure spreaders, each.....	do. 103.18	103.33	100.55	99.8	102.7
Mowers, each.....	do. 47.89	47.23	46.01	101.4	102.7
Picks, each.....	cents. 70.7	70.7	66.0	100.0	107.1
Plows, turning, each.....	dollars. 11.53	11.45	10.76	100.7	106.4
Scythes, each.....	cents. 87.7	86.0	74.1	102.0	116.1
Saddles, each.....	dollars. 16.86	16.56	14.52	101.8	114.0
Teddlers, each.....	do. 30.34	29.40	27.40	103.2	107.0
Wagons, single, each.....	do. 48.78	47.45	44.47	102.8	106.7
Wagons, double, each.....	do. 72.41	68.83	60.72	105.2	113.4
Carbolic acid, crude, pound.....	cents. 35.4	36.0	30.0	101.0	116.7

Comparative prices of articles purchased by farmers in 1910, 1909, and 1899—Continued.

Articles.	1910	1909	1899	Percent- age 1910 to 1909.	Percent- age 1909 to 1899.
Copperas, pound.....cents.	10.1	10.0	10.0	101.0	100.0
Lime, barrel.....dollars.	1.30	1.29	1.12	101.0	115.2
Paris green, pound.....cents.	30.5	30.5	27.0	100.0	113.0
Sulphur pound.....do.	8.5	8.5	8.5	100.0	100.0
Witch-hazel, pint bottle.....do.	25.3	25.0	25.0	101.3	100.0
Baskets, one-half bushel, each.....do.	52.6	51.2	39.0	102.7	131.3
Milk cans, 10-gallon, each.....dollars.	2.70	2.68	2.56	100.9	104.7
Milk pails, each.....cents.	37.9	37.7	34.4	100.4	109.6
Paints, ready mixed gallon.....dollars.	1.88	1.62	1.29	116.3	125.6
Paint brushes, each.....cents.	78.2	76.3	67.9	102.5	112.4
Rope, hemp, pound.....do.	13.0	13.6	12.4	95.5	109.7
Sacks, grain, each.....do.	19.0	18.0	14.0	105.7	128.6
Scales, small, each.....dollars.	1.04	1.04	.96	100.0	108.3
Twine, binder, 100 pounds.....do.	9.40	9.74	9.06	96.5	107.5
Average, all articles.....				101.58	112.1

Quantities purchasable by value of 1 acre.

	Corn.			Wheat.			Cotton.			Average of all crops.		
	1910	1909	1899	1910	1909	1899	1910	1909	1899	1910	1909	1899
Coal oil.....gallons.	102.8	107.0	56.4	97.2	110.0	48.3	194.8	155.4	88.2	119.0	115.6	63.0
Coffee.....pounds.	59.4	80.4	49.5	56.1	82.6	42.4	112.5	116.7	77.4	68.8	86.9	55.3
Flour.....barrels.	2.3	2.4	1.8	2.1	2.5	1.5	4.3	3.5	2.8	2.6	2.6	2.0
Lard.....pounds.	83.6	96.8	82.6	78.9	99.5	70.9	158.2	140.5	129.3	96.7	104.6	92.3
Matches.....boxes.		304.0	170.2		312.4	146.0		441.2	266.4		328.4	190.2
Salt.....barrels.	8.3	9.5	6.1	7.8	9.8	5.3	15.6	13.8	9.6	9.5	10.3	6.8
Soap.....cakes.	313.8	362.8	213.3	296.5	372.8	183.0	594.4	526.5	333.8	363.1	391.9	238.3
Tar.....pounds.	180.7	205.4	118.2	170.7	211.1	101.4	342.2	298.1	185.0	209.1	221.9	132.1
Sugar.....do.	237.1	265.3	161.5	223.9	272.6	138.5	448.9	385.0	252.8	274.3	286.6	180.5
Tobacco.....do.	29.2	33.8	20.4	27.6	34.7	17.5	55.3	49.0	31.9	33.8	36.5	22.8
Brooms.....do.	25.3	34.5	29.8	23.9	35.5	25.5	47.9	50.1	46.6	29.2	37.3	33.3
Dish pans.....do.	43.1	48.7	29.7	40.7	50.1	25.4	81.7	70.7	46.4	49.9	52.6	33.1
Dinner plates.....sets.	19.1	21.3	12.6	18.0	21.8	10.8	36.2	30.9	19.6	22.1	23.0	14.0
Fruit jars.....dozen.	17.1	19.4	11.7	16.1	19.9	10.0	32.3	28.1	18.3	19.7	20.9	13.1
Kitchen chairs.....do.	16.3	18.6	11.8	15.4	19.1	10.1	30.8	27.0	18.4	18.8	20.1	13.2
Lamps.....do.		31.5	18.5		32.4	15.9		45.8	29.0		34.1	20.7
1 in pails.....do.	54.6	62.3	37.0	51.6	64.0	31.7	103.3	90.4	57.9	63.1	67.3	41.3
Wooden buckets.....do.	47.8	55.9	37.7	45.1	57.4	32.3	90.4	81.1	58.9	55.2	60.4	42.1
Wooden washtubs.....do.	15.7	18.4	12.1	14.8	18.9	10.4	29.7	26.7	18.9	18.2	19.9	13.5
Gloves.....pairs.	15.7	18.0	11.9	14.8	18.5	10.2	29.6	26.1	18.6	18.1	19.5	13.3
Hats, felt.....do.	7.0	8.1	5.1	6.6	8.3	4.4	13.3	11.7	8.0	8.1	8.7	5.7
Umpers.....do.	17.0	20.5	13.5	16.1	21.1	11.9	32.3	29.8	21.7	19.7	22.2	15.5
Overalls.....do.	15.8	18.9	13.0	14.9	19.4	11.1	29.9	27.4	20.3	18.3	20.4	14.5
Raincoats.....do.	3.3	3.8	2.6	3.1	3.9	2.2	6.3	5.6	4.0	3.8	4.1	2.9
Rubber boots.....pairs.	2.9	3.6	2.6	2.8	3.7	2.3	5.5	5.3	4.1	3.4	3.9	2.9
Shirts, flannel.....do.	9.2	10.6	7.0	8.7	10.8	6.0	17.5	15.3	11.0	10.7	11.4	7.9
Shoes, brogan.....pairs.	6.7	7.8	5.8	6.3	8.1	4.9	12.7	11.4	9.0	7.8	8.5	6.4
Calico.....do.	196.6	230.3	163.7	185.7	236.7	140.4	372.4	334.2	256.2	227.5	248.8	182.9
Muslin.....do.	142.2	168.9	118.2	134.4	173.6	101.4	269.4	245.1	185.0	164.6	182.4	132.1
Sheeting.....do.	68.9	83.5	59.5	65.1	85.8	50.1	130.5	121.2	93.1	79.7	90.2	66.5
Axes.....do.	15.1	16.9	10.3	14.2	17.4	8.8	28.5	24.6	16.1	17.4	18.3	11.5
Barb wire.....pounds.	424.4	481.0	287.5	401.0	494.3	246.6	803.8	698.1	450.0	491.1	519.6	321.3
Dung forks.....do.	18.8	22.0	13.7	17.7	22.6	11.8	35.5	32.0	21.5	21.7	23.8	15.3
Hatchets.....do.	22.5	25.8	15.8	21.3	26.5	13.6	42.7	37.4	24.8	26.1	27.8	17.7
Lanterns.....do.	18.3	19.7	11.8	17.3	20.3	10.1	34.6	28.6	18.4	21.1	21.3	13.1
Nails.....do.	403.5	482.5	285.6	403.5	495.9	245.0	808.9	700.3	447.0	494.2	521.3	319.1
Pitchforks.....do.	22.9	26.8	16.8	21.6	27.5	14.4	43.4	38.8	26.2	26.5	28.9	18.7
Pincers.....do.	30.3	34.4	20.5	28.6	35.3	17.5	57.4	49.9	32.0	35.1	37.1	22.9
Saws, buck.....do.	17.3	19.8	12.0	16.4	20.3	10.3	32.8	28.7	18.8	20.0	21.4	13.4
Screw hooks.....boxes.	40.9	45.8	26.9	38.6	47.0	23.1	77.4	66.4	42.2	47.3	49.5	30.1
Screw eyes.....do.	41.7	46.9	27.5	39.3	48.2	23.5	78.9	68.1	43.0	48.2	50.7	30.7
Steel traps.....do.	48.8	55.1	34.6	46.1	56.6	29.7	92.4	79.9	54.1	56.5	59.5	38.7
Shovels.....do.	17.2	19.8	12.2	16.3	20.3	10.4	32.6	28.7	19.0	19.9	21.4	13.6
Staples.....pounds.	353.4	399.0	242.5	333.6	410.0	208.0	678.8	579.0	379.4	414.7	431.0	270.9
Steel wire.....do.	360.4	404.3	238.3	340.4	415.4	204.5	682.5	586.7	373.1	417.0	436.7	266.4
Wire, fence.....rods.	37.5	42.2	25.0	35.4	43.4	21.4	70.9	61.3	39.1	43.3	45.6	27.9
Axle grease.....boxes.	132.4	152.0	88.6	125.0	156.2	76.0	250.7	220.6	138.8	153.2	164.2	99.1
Buggy whips.....do.	31.6	36.1	21.4	29.9	37.1	18.3	59.9	52.4	33.5	36.6	39.0	23.9
Corncutters.....do.	48.1	55.7	34.0	45.4	57.2	29.2	91.1	80.8	53.3	55.6	60.1	38.0
Churns.....do.	12.9	14.6	9.2	12.1	15.0	7.9	24.3	21.2	14.5	14.9	15.8	10.3
Halters.....do.	18.2	21.5	13.5	17.2	22.1	11.6	34.5	31.2	21.1	21.1	23.3	15.1
Horse blankets.....do.	7.5	8.6	5.4	7.1	8.8	4.6	14.1	12.5	8.4	8.6	9.3	6.0

Quantities purchasable by value of 1 acre—Continued.

	Corn.			Wheat			Cotton.			Average of all crops.		
	1910	1909	1899	1910	1909	1899	1910	1909	1899	1910	1909	1899
Hoes.....	29.1	33.9	21.9	27.5	34.9	18.8	55.2	49.2	34.3	33.7	36.7	24.5
Picks.....	18.9	21.5	12.9	17.9	22.1	11.1	35.8	31.2	20.2	21.9	23.2	14.4
Sprayers.....		16.1	9.4		16.5	8.0		23.3	14.7		17.3	10.5
Scythes.....	15.2	17.7	11.5	14.4	18.2	9.9	28.9	25.7	18.0	17.6	19.1	12.8
Carbolic acid.....pounds..	37.8	43.4	28.4	35.7	44.6	24.3	71.5	63.0	44.4	43.7	46.9	31.7
Copperas.....do.....	132.4	152.0	85.1	125.0	156.2	73.0	250.7	220.6	133.2	153.2	164.2	95.1
Lime.....barrels.....	10.3	11.8	7.6	9.7	12.1	6.5	19.5	17.1	11.9	11.9	12.7	8.5
Paris green.....pounds..	43.8	49.8	31.5	41.4	51.2	27.0	83.0	72.3	49.3	50.7	53.8	35.2
Sulphur.....do.....	157.3	178.8	100.1	148.6	183.8	85.9	297.9	259.5	156.7	182.0	193.2	111.9
Witch-hazel.....pints.....	52.8	60.8	34.0	49.9	62.5	29.2	100.1	88.2	53.3	61.1	65.7	38.0
Baskets, $\frac{1}{2}$ -bushel.....	25.4	29.7	21.8	24.0	30.5	18.7	48.1	43.1	34.2	29.4	32.1	24.4
Milk cans, 10-gallon.....	5.0	5.7	3.3	4.7	5.8	2.9	9.4	8.2	5.2	5.7	6.1	3.7
Milk pails.....	35.3	40.3	24.7	33.3	41.4	21.2	66.8	58.5	38.7	40.8	43.6	27.6
Paints, ready-mixed, gallons.....	7.1	9.4	6.6	6.7	9.6	5.7	13.5	13.6	10.3	8.2	10.1	7.4
Paint brushes.....	17.1	19.9	12.5	16.2	20.5	10.8	32.4	28.9	19.6	19.8	21.5	14.0
Rope, hemp.....pounds..	102.8	111.8	68.6	97.2	114.9	58.9	194.8	162.2	107.4	119.0	120.7	76.7
Sacks, grain.....	70.4	84.4	60.8	66.5	86.8	52.1	133.3	122.6	95.1	81.4	91.2	67.9
Scales, small.....	12.9	14.6	8.9	12.1	15.0	7.6	24.3	21.2	13.9	14.9	15.8	9.9
Twine, binder.....pounds..	142.2	156.1	93.9	134.4	160.4	80.6	269.4	226.5	147.0	164.6	168.6	105.0

The number of acres of corn, wheat, etc., which was required to buy the articles specified, in 1910, 1909, and 1899, was as follows:

[Cost in acres of produce.]

	Corn.			Wheat.			Cotton.			Average of all crops.		
	1910	1909	1899	1910	1909	1899	1910	1909	1899	1910	1909	1899
Stove.....	1.7	1.4	2.3	1.8	1.4	2.7	0.9	1.0	1.5	1.4	1.3	2.1
Shotgun.....	.8	.7	1.4	.9	.7	1.7	.4	.5	.9	.7	.7	1.3
Buggy.....	5.9	5.1	8.3	6.2	4.9	9.6	3.1	3.5	5.3	5.1	4.7	7.4
Cream separator.....	4.3	3.9	7.6	4.6	3.8	8.9	2.3	2.7	4.9	3.7	3.6	6.8
Grindstone.....	.3	.2	.4	.3	.2	.5	.2	.2	.3	.3	.2	.4
Harness (single).....	1.4	1.2	1.8	1.5	1.2	2.1	.7	.8	1.1	1.2	1.1	1.6
Harrow.....	.8	.7	1.1	.8	.7	1.3	.4	.5	.7	.7	.6	1.0
Manure spreader.....	7.7	6.8	11.8	8.2	6.6	13.8	4.1	4.7	7.5	6.7	6.3	10.6
Mower.....	3.6	3.1	5.4	3.8	3.0	6.3	1.9	2.1	3.5	3.1	2.9	4.8
Plow (turning).....	.9	.8	1.3	.9	.7	1.5	.5	.5	.8	.7	.7	1.1
Saddle.....	1.3	1.1	1.7	1.3	1.1	2.0	.7	.8	1.1	1.1	1.0	1.5
Tedder.....	2.3	1.9	3.2	2.4	1.9	3.8	1.2	1.3	2.1	2.0	1.8	2.9
Wagon (single).....	3.6	3.1	5.2	3.9	3.0	6.1	1.9	2.2	3.3	3.2	2.9	4.7
Wagon (double).....	5.4	4.5	7.1	5.8	4.4	8.3	2.9	3.1	4.6	4.7	4.2	6.4

Purchasing power of the produce of 1 acre in 1910 compared with the purchasing power of 1 acre in 1909 and 1899, respectively.

	Purchasing power 1910 compared with 1909 (represented by 100) of 1 acre of—				Purchasing power 1910 compared with 1899 (represented by 100) of 1 acre of—			
	Corn.	Wheat.	Cotton.	Average all crops.	Corn.	Wheat.	Cotton.	Average all crops.
Coal oil.....	96	88	125	103	182	201	221	189
Coffee.....	74	68	96	79	120	132	145	124
Flour.....	96	84	123	100	128	140	154	130
Lard.....	86	79	113	92	101	111	122	105
Salt.....	87	80	113	92	136	147	162	140
Soap.....	86	80	113	93	147	162	178	152
Starch.....	88	81	115	94	153	168	185	158
Sugar.....	89	82	117	96	147	162	178	152
Tobacco.....	86	80	113	93	143	158	173	148
Brooms.....	73	67	96	78	85	94	103	88
Dish pans.....	89	81	116	95	145	160	176	151
Dinner plates.....	90	83	117	96	152	167	185	158

Purchasing power of the produce of 1 acre in 1910 compared with the purchasing power of 1 acre in 1909 and 1899, respectively—Continued.

	Purchasing power 1910 compared with 1909 (represented by 100) of 1 acre of—				Purchasing power 1910 compared with 1899 (represented by 100) of 1 acre of—			
	Corn.	Wheat.	Cotton.	Average all crops.	Corn.	Wheat.	Cotton.	Average all crops.
Fruit jars.....	88	81	115	94	146	161	177	150
Kitchen chairs.....	88	81	114	94	138	152	167	142
Tin pails.....	88	81	114	94	148	163	178	153
Wooden buckets.....	85	79	111	91	127	140	153	131
Wooden washtubs.....	85	78	111	91	130	142	157	135
Gloves.....	87	80	113	93	132	145	159	136
Hats.....	86	80	114	93	137	150	166	142
Jumpers.....	83	76	108	89	126	135	149	127
Overalls.....	84	77	109	90	122	134	147	126
Raincoats.....	87	79	112	93	127	141	158	131
Rubber boots.....	81	76	104	87	112	122	134	117
Shirts, flannel.....	87	81	114	94	131	145	159	135
Shoes.....	86	78	111	92	116	129	141	122
Calico.....	85	78	111	91	120	132	145	124
Muslin.....	84	77	110	90	120	133	146	125
Sheeting.....	83	76	108	88	116	128	140	120
Axes.....	89	82	116	95	147	161	177	151
Barb wire.....	88	81	115	95	148	163	179	153
Dungforks.....	85	78	111	91	137	150	165	142
Hatchets.....	87	80	114	94	142	157	172	147
Lanterns.....	93	85	121	99	155	171	188	161
Nails.....	84	81	116	95	141	165	181	155
Pitchforks.....	85	79	112	92	136	150	166	142
Pincers.....	88	81	115	95	148	163	179	153
Saws.....	87	81	114	93	144	159	174	149
Screw hooks.....	89	82	117	96	152	167	183	157
Screw eyes.....	89	82	116	95	152	167	183	157
Steel traps.....	89	81	116	95	141	155	171	146
Shovels.....	87	80	114	93	141	157	172	146
Staples.....	90	83	117	96	148	163	179	153
Steel wire.....	89	82	116	95	151	166	183	157
Wire, fence.....	89	82	116	95	150	165	181	155
Axle grease.....	87	80	114	93	149	164	181	155
Buggy whips.....	88	81	114	94	148	163	179	153
Corn cutters.....	86	79	113	93	141	155	171	146
Churns.....	88	81	115	94	140	153	168	145
Halters.....	85	78	111	91	135	148	164	140
Horse blankets.....	87	81	113	92	139	154	168	143
Hoes.....	86	79	112	92	133	146	161	138
Picks.....	88	81	115	94	147	161	177	152
Scythes.....	86	79	112	92	132	145	161	138
Carbolic acid.....	87	80	113	93	133	147	161	138
Copperas.....	87	80	114	93	156	171	188	161
Lime.....	87	80	114	94	136	149	164	140
Paris green.....	88	81	115	94	139	153	168	144
Sulphur.....	88	81	115	94	157	173	190	163
Witch-hazel.....	87	80	113	93	155	171	188	161
Baskets.....	86	79	112	92	117	128	141	120
Milk cans.....	88	81	115	93	152	162	181	154
Milk pails.....	88	80	114	94	143	157	173	148
Paints.....	76	70	99	81	108	118	131	111
Paint brushes.....	86	79	112	92	137	150	165	141
Rope.....	92	85	120	99	150	165	181	155
Sacks.....	83	77	109	89	116	128	140	120
Scales.....	88	81	115	94	145	159	175	151
Twine.....	91	84	119	98	151	167	183	157
Stoves.....	86	79	112	92	139	153	168	144
Shotguns.....	88	81	115	94	171	189	207	177
Buggies.....	86	79	112	92	140	155	170	146
Cream separators.....	89	83	117	96	176	195	213	183
Grindstones.....	86	79	112	92	140	154	169	145
Harness.....	87	80	113	93	129	142	156	134
Harrow.....	88	80	114	94	138	152	167	143
Manure spreaders.....	88	81	115	94	153	167	186	158
Mowers.....	87	80	113	93	151	166	182	156
Plows.....	87	80	114	94	147	162	177	152
Saddles.....	86	79	113	93	135	149	164	140
Tedders.....	85	78	111	91	142	156	172	147
Wagons (single).....	86	78	112	92	143	158	173	148
Wagons (double).....	84	77	109	90	132	145	160	136
Average, all articles.....	86.7	79.8	109.5	92.9	139.2	153.2	168.5	144.1

REPORT OF THE LIBRARIAN.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE LIBRARIAN,
Washington, D. C., October 23, 1911.

SIR: I have the honor to submit herewith the executive report of the Library for the fiscal year ended June 30, 1911.

Respectfully,

CLARIBEL R. BARNETT,
Librarian.

Hon. JAMES WILSON,
Secretary of Agriculture.

GENERAL STATEMENT.

It will be seen from the detailed reports on the various branches of the Library's work which follow that the past year has been one of distinct progress, in spite of the handicaps under which the Library has labored due to lack of room and changes in the staff. In the Report of the Librarian for 1909 attention was called to the necessity for a settled and definite library policy in the department, especially in regard to the relation of the main Library to the libraries of the bureaus and divisions. There is cause for gratification that such a policy has finally been outlined and adopted through the approval by the Secretary of Agriculture of the recommendations in regard to "Libraries" made by the Committee on Economy and Efficiency in the Department of Agriculture in their report issued June 30, 1911. The full text of the chapter on "Libraries" as printed in the committee's report is given in Appendix 2. These recommendations having been approved by the Secretary of Agriculture, as stated above, became effective on July 1, 1911. It is quite probable that the coming year may show no marked change in the work of the Library as the result of the definite adoption of the recommendations of the committee, since the policy expressed in the recommendations has in general been the policy under which the Library has been working for many years. It is, however, confidently hoped that the official recognition and adoption of a definite library policy will insure greater permanence and continuity of effort in the library work of the department and that the centralization of administration in library matters provided for in the recommendations will in time result in greater economy and efficiency by minimizing to the smallest possible degree the duplication and overlapping of work and by providing for the widest possible use of material.

STAFF MEETINGS.

Last fall it was decided to resume the meetings of the library staff comprising all engaged in library work in the department. The four meetings which were held during the year were suggestive and helpful, and gave further evidence on the part of the staff of faithful, conscientious service and a desire to cooperate in increasing the efficiency of the library work of the department.

ROOMS.

The need for more space for library purposes is imperative. The past year has brought no relief in the crowded condition of the Library. The work of the cataloguing and periodical divisions has been greatly hampered from lack of sufficient room for desks for the assistants connected with the work, the bookshelves are full to overflowing, and in addition the Library is much inconvenienced by lack of a room for the unpacking, sorting, and temporary storage of material. Under the present conditions the work of the Library is crippled and its usefulness seriously impaired.

LIBRARY PUBLICATIONS.

The Library publications of the year included the Report of the Librarian for 1910, a pamphlet of 16 pages, which was issued in December, 1910, and the Monthly Bulletin of the Library, the numbers for July, 1910, to June, 1911, comprising 352 pages, with author index of 85 pages to volume 1, 1910. The Monthly Bulletin for January, 1911, contained, in addition to the list of accessions, a complete List of Works on Pigeons, contained in the Library.

AGRICULTURAL LIBRARIES SECTION OF THE AMERICAN LIBRARY ASSOCIATION.

In the report of last year mention was made of the two sessions of the Agricultural Libraries Round Table held in connection with the meeting of the American Library Association at Mackinac Island in June, 1910. In further reference to the work begun at this meeting it should be of interest to librarians connected with agricultural libraries to note that a petition for the formation of an agricultural libraries section in the American Library Association was presented to the council of the association and granted by them at their meeting in Pasadena, Cal., in May, 1911. There is reason to hope that the section can be of great use in furthering the advancement of agricultural libraries and stimulating an interest in agricultural literature.

USE OF THE LIBRARY.

During the past year the charges recorded at the loan desk of the main Library numbered 36,250, an increase of 1,070 compared with the previous year. The record of similar charges for the past five years is as follows:

Number of books borrowed for use outside of the main Library¹ for the fiscal years 1907 to 1911.

Months.	Fiscal year					Months.	Fiscal year.				
	1906-7	1907-8	1908-9	1909-10	1910-11		1906-7	1907-8	1908-9	1909-10	1910-11
July.....	1,078	1,375	1,642	2,490	2,357	February....	1,715	2,380	2,798	3,221	3,340
August.....	1,378	1,446	1,455	2,334	2,381	March.....	1,894	1,969	3,000	3,310	3,668
September....	1,088	1,270	1,893	2,540	2,259	April.....	1,885	1,669	3,169	2,804	3,805
October.....	1,594	1,789	2,714	2,610	3,118	May.....	1,004	1,981	2,913	2,708	2,589
November....	1,599	2,051	2,406	3,567	3,083	June.....	1,322	2,001	2,873	2,917	3,163
December....	1,832	1,918	2,682	3,315	2,952	Total..	18,994	22,470	30,606	35,180	36,250
January.....	2,005	2,621	3,061	3,364	3,535						

¹ These figures represent the number of books taken from the main Library for use in the offices of the department.

As has been pointed out in previous reports, the above statistics indicate only in part the extent to which the Library was used. The figures do not include (1) a record of the circulation of single unbound numbers; (2) a record of the use of the books deposited in the various bureaus and divisions of the department; (3) a record of the books used in the Library. It has not seemed advisable to attempt to collect statistics covering completely the use to which the Library's various facilities are put, partly because of the cost, time, and trouble involved, and partly on account of the great inconvenience to users. In order, however, to give a more adequate idea of the total use of the Library's collections, the statistics of the circulation of books and periodicals in the bureau and division libraries, in so far as they have been kept, have in the following table been added to the statistics of the main Library:

Approximate number of books and periodicals borrowed from the main Library and the bureau and division libraries.¹

	Books.	Periodicals.
Main Library.....	36,250	85,000
Bureau of Chemistry library.....	7,563	18,423
Bureau of Entomology library.....	3,500	.....
Forest Service library.....	3,647	800
Bureau of Plant Industry library.....	14,984	26,223
Total.....	65,944	130,446

¹ No statistics of the circulation of books and periodicals have been kept in the libraries of the Bureau of Statistics, Bureau of Biological Survey, Dairy Division, Office of Public Roads, and Office of Experiment Stations.

The Bureau of Animal Industry and the Bureau of Soils do not maintain libraries, as their offices are in close proximity to the main Library.

While the figures given above are in part only estimates, it is believed that they are in all cases very conservative estimates, and that the total figures represent very inadequately the actual use of the Library. No figures in regard to books used in the libraries and not charged are included.

INTERLIBRARY LOANS.

The number of books borrowed from other libraries during the past year, namely, 6,466, was surprisingly large, and was an increase of 1,765, or 33 per cent, over the previous year. Of the total number of

books borrowed, 6,397 were borrowed from Washington libraries and 69 from libraries outside of Washington. Our most frequent demands were made upon the Library of Congress, the library of the Surgeon General's Office, the library of the United States Geological Survey, and the library of the Patent Office. The names of the libraries outside of the city from which books were borrowed, and the number of books borrowed, were as follows:

American Philosophical Society Library, Philadelphia-----	1
Arnold Arboretum Library, Jamaica Plain-----	6
Boston Public Library-----	1
Boston Society of Natural History Library-----	1
College of Physicians and Surgeons Library, Philadelphia-----	1
Columbia University Library, New York-----	1
Gray Herbarium Library, Cambridge-----	9
Harvard University Library-----	14
John D. Smith Library, Baltimore-----	2
Lloyd Library, Cincinnati-----	8
Massachusetts Horticultural Society Library, Boston-----	3
Missouri Botanical Garden Library, St. Louis-----	9
Museum of Comparative Zoology Library, Cambridge-----	9
Ohio State Library, Columbus-----	1
Ohio State University Library, Columbus-----	1
University of Pennsylvania Library, Philadelphia-----	1
Yale University Library, New Haven-----	1
Total-----	69

The number of books lent by this Library during the past year to libraries and scientists outside of the city was 613, an increase of 65 as compared with the previous year. The statistics for such loans for the past five years, arranged geographically, are as follows:

Record of books lent outside of Washington during the fiscal years 1907-1911.

States, etc.	Fiscal year.					States, etc.	Fiscal year.				
	1906-7.	1907-8.	1908-9.	1909-10.	1910-11.		1906-7.	1907-8.	1908-9.	1909-10.	1910-11.
Alabama.....	7	1	.....	.....	8	New Jersey.....	.....	.....	3	2	1
Alaska.....	.....	2	.....	.....	.....	New York.....	21	55	53	91	70
Arizona.....	31	18	13	11	5	North Carolina.....	2	24	18	38	38
Arkansas.....	.....	1	.....	.....	2	North Dakota.....	.....	3	.....	2	18
California.....	10	6	1	10	8	Ohio.....	15	4	17	13	29
Colorado.....	4	2	7	4	7	Oregon.....	.....	9	1	24	38
Connecticut.....	32	15	10	41	11	Pennsylvania.....	4	18	33	4	3
Delaware.....	.....	1	.....	.....	5	Rhode Island.....	.....	.....	.....	1	.....
Florida.....	13	56	81	54	36	South Carolina.....	.....	.....	3	.....	1
Georgia.....	.....	1	1	7	4	South Dakota.....	.....	.....	.....	.....	1
Illinois.....	13	9	11	16	11	Tennessee.....	4	5	3	9	13
Indiana.....	9	7	2	2	15	Texas.....	5	4	1	12	13
Iowa.....	.....	.....	2	6	13	Vermont.....	8	4	16	14	8
Kansas.....	.....	1	1	2	2	Virginia.....	1	13	28	28	15
Kentucky.....	.....	.....	.....	3	11	Washington.....	4	9	1	6	.....
Louisiana.....	9	8	12	13	2	West Virginia.....	9	.....	.....	2	1
Maine.....	1	7	17	9	25	Wisconsin.....	3	13	9	4	37
Maryland.....	9	16	12	8	8	Wyoming.....	4	.....	1	6	7
Massachusetts.....	11	35	3	8	17	Canada.....	.....	.....	1	.....	1
Michigan.....	5	4	7	8	6	Hawaii.....	5	11	14	3	7
Minnesota.....	1	11	9	8	5	Jamaica.....	.....	.....	1	.....	.....
Mississippi.....	.....	.....	2	1	8	Japan.....	.....	.....	.....	.....	1
Missouri.....	7	7	4	4	1	Mexico.....	.....	.....	.....	1	2
Montana.....	.....	.....	1	3	2	Porto Rico.....	.....	1	2	52	55
Nebraska.....	.....	6	12	18	41	Total.....	248	391	416	548	613
Nevada.....	1	.....	.....	.....	.....		
New Hampshire.....	.....	4	3	.....	1						

In order to facilitate the work in connection with the lending of our books to other libraries, it was deemed advisable during the past year to formulate some definite rules for interlibrary loans. The rules are printed as Appendix 4 to this report. They have been found helpful in systematizing the work.

No separate record of the loans to other departments and libraries in the city have been kept, but it is certain that the use of our collections by other Government offices has increased considerably in recent years.

ACCESSIONS.

The number of books, pamphlets, and maps added to the Library during the past year compared with the accessions of the previous year is as follows:

Accessions.	Fiscal year 1910.	Fiscal year 1911.
Purchases:		
Volumes.....	1,454	2,030
Pamphlets.....	65	89
Maps.....	8	1
Serials and continuations.....	1,574	736
	3,101	2,856
Gifts:		
Volumes.....	488	614
Pamphlets.....	387	502
Maps.....	43	12
Continuations.....	2,728	3,463
	3,646	4,591
Volumes made by binding periodicals and serials.....	1,409	1,369
	8,156	8,816

From the above tables it will be seen that the accessions of the past year, namely, 8,816, all of which were catalogued, exceeded those of the previous year by 660. The total recorded number of books, pamphlets, and maps in the Library on July 1, 1911, was 115,653. In addition, the Library had on hand on July 1, 1911, unaccessioned, uncatalogued, and unclassified material as follows: Volumes, 444; pamphlets, 950; continuations, 572; maps, 18; total, 1,984.

As is shown from the above tables, more than half of the accessions of the last year were gifts, the number exceeding that of the previous year by 945. It is regretted that space does not permit us to give a complete list of the donors. Special mention should, however, be made of the most notable gift of the year, namely, a set of the *Annals of the Royal Botanic Garden, Calcutta*, which is probably the costliest and most beautiful publication issued by any botanical institution. The Royal Botanic Garden presented the set to the Library in exchange for publications of the department.

Continued progress was made during the year in completing imperfect files of periodicals. Among the more important sets completed were the following:

Annales de chimie et de physique.

Archiv für entwicklungsmechanik der organismen.

Archiv für experimentelle pathologie und pharmakologie.

Archives internationales de pharmacodynamie.
 Florence. Reale accademia economico-agraria dei georgofili di Firenze, Atti.
 Jahrbücher für wissenschaftliche botanik.
 Journal of botany, British and foreign.
 Kennel club calendar and stud book.
 Milch-zeitung.
 New York academy of sciences, Annals.
 Societa botanica italiana, Bollettino.
 Zoologische jahrbücher.

CATALOGUING AND CLASSIFICATION.

During the year 2,644 volumes, 591 pamphlets, 5,568 continuations, and 13 maps were catalogued, making a total of 8,816, an increase of 660 over the previous year. There were added to the main (dictionary) catalogue 20,951 cards and 1,699 were withdrawn, making the net addition 19,252, a decrease of 2,074 as compared with the previous year. This decrease in the number of cards added to the catalogue, whereas there was an increase in the number of books catalogued compared with the previous year, is explained by the fact that a large number of reprinted cards for department publications were added to the catalogue during the fiscal year 1910. It is estimated that the main dictionary catalogue now contains approximately 260,000 cards.

The number of titles prepared during the year by the Library for printing by the Library of Congress in what is known as the "Agr" series was as follows:

Cards for accessions and recatalogued books.....	1,557
Cards for department publications.....	355
Cards for foreign agricultural periodicals.....	68
Total.....	1,980

The total number of titles prepared by this Library since 1902, in which year the printing of our cards by the Library of Congress was begun, is 18,101. It may be of interest to other agricultural libraries to give here the list of series for which this Library prepares printed cards. With a few exceptions, cards have been prepared for the complete series. The cards are printed by the Library of Congress in the "Agr" series, and are available for purchase.

Series for which the Department of Agriculture Library prints cards.

Belträge zur kryptogamenflora der Schweiz.
 Bibliothèque d'agriculture coloniale.
 Biologia centrali-americana.
 Bohemia—Landeskulturrat—Deutsche sektion. Arbeiten.
 Botanische exkursionen und pflanzengeographische studien in der Schweiz.
 Buitenzorg, Java. 's Lands plantentuin. Mededeelingen. (Now superseded by Mededeelingen of Dept. van landbouw, Dutch East Indies.)
 Canada—Department of Agriculture—Forest branch. Bulletin.
 ———— Live stock commissioner's branch. Bulletin.
 Cold Spring Harbor monographs.
 Deutsche gesellschaft für züchtungskunde. Arbeiten.
 Deutsche landwirtschafts-gesellschaft. Anleitungen für den praktischen landwirt.
 ———— Arbeiten.
 East Indies (Dutch)—Departement van landbouw. Mededeelingen.
 Encyclopédie vétérinaire (Cadéac).
 Federated Malay States—Department of Agriculture. Bulletin.
 Fiji—Department of Agriculture. Bulletin.

- Germany—Auswärtiges amt. Berichte über land- und forstwirtschaft im auslande.
 Germany—Reichsamt des innern. Berichte über landwirtschaft.
 Hawaiian sugar planters' association—Experiment station—Division of agriculture and chemistry. Bulletin.
 ——— Division of entomology. Bulletin.
 ——— Division of pathology and physiology. Bulletin.
 Indian forest memoirs. Economic products series.
 ——— Forest zoology series.
 Italy—Direzione generale dell' agricoltura. Annali di agricoltura.
 Kew. Royal gardens. Bulletin of miscellaneous information. Additional series.
 Landboskrifter.
 Minnesota plant studies.
 Mitteilungen aus dem forstlichen versuchswesen Österreichs.
 Monographien landwirtschaftlicher nutztiere.
 New South Wales—Department of agriculture. Farmers' bulletin.
 New York (State)—Department of agriculture. Bulletin.
 One and all garden books.
 Padua. R. Stazione bacologica sperimentale. (Not a current series.)
 Pennsylvania—Department of agriculture. Bulletin. (Cards printed since 1900.)
 (Das) pflanzenreich (Engler). (Earlier cards were printed by the Library of Congress.)
 Queensland—Department of agriculture. Bulletin. (Not a current series.)
 Sweden—Landbruksstyrelse. Meddelanden. (Have printed cards for numbers of this series having a personal author, since 1903.)
 Texas—Department of agriculture. Bulletin.
 Torrey botanical club. Memoirs.
 U. S. National herbarium. Contributions. (Earlier cards were printed by the Library of Congress.)
 (Die) vegetation der erde (Drude). (Earlier cards printed by the Library of Congress.)
 Vienna. K. K. zoologisch-botanische gesellschaft. Abhandlungen.

As in previous years, it was possible to keep the cataloguing of the accessions of the year fairly up to date, with the exception of the pamphlets and serials. The unaccessioned, unclassified, and uncatalogued material on hand on July 1, 1911, compared with the material on hand July 1, 1910, was as follows:

Uncatalogued material.	Fiscal year 1910.	Fiscal year 1911.
Purchases:		
Volumes.....	10	190
Pamphlets.....	6	5
Continuations.....	217	13
Total.....	233	208
Gifts:		
Volumes.....	145	254
Pamphlets.....	736	945
Continuations.....	624	559
Maps.....	1	18
Total.....	1,506	1,776
Grand total.....	1,739	1,984

It is probable that the past year would have shown no increase in the total amount of uncatalogued material had it not been for the fact that two large foreign shipments of books purchased were received a few days before July 1, 1911. The number of uncatalogued continuations was reduced during the year by 269, but the number of uncatalogued pamphlets was increased by 208. As described in the

report of last year, in order to shorten the process of cataloguing the pamphlets which were accumulating from year to year, it was decided to make for the less important ones only temporary author cards, with an abbreviated imprint, and to keep the pamphlets thus catalogued in a separate collection in pamphlet boxes arranged according to the library classification. This collection now numbers 1,482. On account of pressure of other work only 347 pamphlets were added to the collection during the past year. In addition to this collection of pamphlets, which are represented in the catalogue only by author cards, the Library has accumulated a considerable number of "reprints" from periodicals contained in the Library. This collection during the past year was arranged alphabetically by the authors of the articles and placed in pamphlet boxes. The collection numbers 1,100. The chief use of the collection up to the present time has been in connection with interlibrary loans. When the loan of a periodical is requested and the particular article desired is known, the "reprint" of the article, in case it is contained in our collection, is sent instead of the volume of the periodical. This is a saving of postage and of wear and tear on the bound volume, which remains in the Library available for reference. It is hoped that eventually it will be possible to make abbreviated author cards for the "reprints." The collection can then be classified by subject and incorporated with the other pamphlet collection described above. The Library would be glad to receive collections of "reprints" on subjects of interest in connection with the work of the department.

Printed cards for all the current publications of the department were prepared during the year, the number of titles being 355. The demands for these cards from libraries and agricultural institutions are steadily increasing.

Little work has been done during the year in the revision of the catalogue, the need for which is very great. Changes in the cataloguing staff and the overcrowded condition of the cataloguing room have hampered the current work, and as a result the services of none of the cataloguers have been available for the revision of the catalogue. It is necessary for two of the cataloguers to have their desks in cramped quarters in the book rooms some distance from the cataloguing room, an inconvenient arrangement, which retards the work. It is earnestly hoped that the coming year will bring some relief by providing an additional room adjoining the present cataloguing room.

PERIODICALS.

The total number of different periodicals received during the year was 1,978, exclusive of annuals and other serials of infrequent issue, a decrease of 24 as compared with the previous year. This decrease is accounted for by the fact that the number of new periodicals added during the year was 106, while the number of periodicals which ceased publication was 130. Of the total number of periodicals received, 756 were purchased and 1,222 received by gift and exchange. To the number of different periodicals purchased should be added 76 duplicates, making a total of 832 periodicals purchased at a cost of approximately \$3,300. Of the 1,978 periodicals currently received by the Library nearly one-fourth are permanently filed in the

libraries of the various bureaus and offices in which they are of special interest. The remaining three-fourths are filed in the main Library, but of this number only about one-half, namely, 760, can be kept in the pigeonholes in the periodical reading room on account of the limited space available.

It is impracticable to keep a complete record for the whole year of the receipt and circulation of current periodicals, but, as in previous years, a count was made of the current periodicals handled daily for a limited period, namely, from April 4 to June 1 in the present year, which, compared with a similar count for May, 1909, and May, 1910, is as follows:

Current periodicals.	May, 1909 (25 days).	May 7 to June 6, 1910 (25 days).	Apr. 4 to June 1, 1911 (49 days).
New numbers received and recorded.....	4,523	4,923	9,450
Daily average.....	181	197	193
Returns from circulation.....	4,731	5,164	14,023
Daily average.....	189	204	286

From the above statement it will be seen that the daily average of new numbers received and recorded is a little less in 1911 than it was in 1910, whereas the daily average of returns from circulation shows an increase of 40 per cent, indicating a largely increased use of the current periodicals. As explained in previous reports, these figures do not, however, give any adequate idea of the use of the current periodicals, as they represent little more than the circulation to bureaus and offices. Of the 1,978 periodicals currently received, between 1,200 and 1,300 circulate regularly among the various bureaus, divisions, and offices; the number to which each periodical is regularly sent varying from 1 to 20. The circulation in a bureau is attended to by the library of the bureau, some periodicals being sent regularly to 24 individuals. After circulating in this way the numbers are returned to the main Library and sent out again to another bureau or office for circulation in the same manner. To get an idea, therefore, of the total circulation of current periodicals in the department, the above figures of the main Library must be supplemented by the data in regard to the circulation of periodicals given in the separate reports of the bureau, division, and office libraries.

As far as is known, this is the only library which attempts to circulate its current periodicals regularly. That this service has grown to its present proportions is due largely to the following reasons: (1) The various offices of the department are widely separated; (2) the scientists of the department find it difficult to come to the Library regularly during office hours to consult the periodicals; (3) the Library has never had space for a periodical reading room large enough to accommodate the current files of all the periodicals received; (4) the work of the various bureaus is so broad that a very large proportion of the periodicals received is of interest to several bureaus, making it difficult to divide the periodicals for filing in the various bureaus and offices to which they are of interest without a great deal of duplication; (5) the importance of the current periodicals in the scientific work of the department. As a result of the

above conditions the present compromise arrangement has gradually been evolved and extended until it has reached proportions never anticipated when the service was first attempted. In fact, it has become so extensive as to be in danger of breaking from its own weight. To explain further the difficulties in connection with the service, a copy of a circular letter which was sent out in June, 1911, to all in the department who receive current periodicals regularly is given below:

CIRCULATION OF CURRENT PERIODICALS.

The Library receives more than 2,000 current periodicals. Of this number about two-thirds circulate regularly among the various bureaus, divisions, and laboratories of the department. The number of different offices to which each periodical is sent varies from 1 to 40. It will be seen, therefore, that if each office retains only three days a number of a periodical circulating regularly to only 20 different offices the last person on the list will receive it after it is two months old. Although not every periodical goes to as many as 20 different offices, a considerable number of them go to more, and the average circulation is very large. The Library has endeavored to help the situation by purchasing additional copies of many periodicals when the need for them seemed imperative. There is a limit, however, to justifiable duplication, and it has been the policy of the Library not to curtail the expenditures for building up the resources of the Library by an extravagant duplication of material. If no periodical were retained more than three days in an office the problem would be comparatively simple, even in the case of the periodicals with the largest circulation, but in spite of rules and appeals it frequently happens that current periodicals are kept in a single office not three days, but several weeks. As a result the Library receives numerous complaints from the users of the periodicals that the periodicals in which they are especially interested are often six months old before they are able to see them. So numerous have these complaints become that it has seemed imperative to bring about a general improvement in the promptness with which the periodicals are used, otherwise the whole object of the circulation will be defeated and may as well be discontinued. Few, if any, libraries attempt to circulate regularly their current periodicals, but the Library has not infrequently received expressions of appreciation of this service, and its discontinuance would doubtless be generally deplored. This circular is therefore being sent to all who receive the periodicals regularly, to ask their cooperation in improving the present service by complying with the inclosed rules and suggestions.¹ The Library will be glad to receive further suggestions for the improvement of the service.

As a result of the circular letter there has been considerable improvement, but the failure on the part of a few to cooperate by using and returning the periodicals promptly seriously interferes with the service and gives reason to fear that it will not be long before it will be necessary to make a radical change in the system.

As in other parts of the Library, lack of space in the periodical department has seriously handicapped its work. The periodical reading room is only large enough to accommodate pigeonhole cases for half the current periodicals filed in the Library, while the periodical workroom is still more inadequate. In fact, the present space for the periodical work should be doubled. The work in connection with the sorting and care of back numbers and duplicates is done under constantly increasing disadvantages. It has been necessary to do much of this work in the public corridor, which is especially to be regretted, not only because the light in the corridor is poor, but also for appearance's sake. Such work necessarily gives an impression of disorderliness and should be done in a room not open to the public. As pre-

¹The rules and suggestions which accompanied the circular letter are printed as Appendix 3 of this report.

viously pointed out, one of the most pressing needs of the Library is a separate room which can be used for the work of unpacking, sorting, and temporary storage.

BINDING.

The number of books and periodicals bound during the past year was 3,274, an increase of 29 over the previous year. While the past two years have shown a considerable increase over previous years in the number of books bound, the number bound is as yet far from being commensurate with the needs of the Library. It is hoped that it will be possible during the coming year to devote more time to this work. With the bookshelves filled to overflowing as they are it is especially important that the periodicals and serials be bound promptly, to reduce the danger of loss by misplacement.

In addition to the 3,274 volumes sent to the Government bindery, 1,510 volumes of periodicals were put in temporary binders, an increase of 1,382 over the previous year. As explained in the report of last year, these temporary binders are used for periodicals which need to be preserved but are not so frequently used as to justify permanent binding. They are also used for incomplete volumes, as they permit of the insertion of the missing numbers when they are obtained, and in the meantime keep the file in an orderly condition, in a form convenient for use. The use of these temporary binders has done much to improve the appearance of the Library by reducing the amount of unbound material on the shelves.

DUPLICATES.

The list of duplicates referred to in the report of last year as being in preparation was printed in October, 1910, and distributed to the libraries of the State agricultural colleges and experiment stations. The list contained 673 titles and represented approximately 2,000 books and pamphlets. All but about 50 were requested and distributed. The demands for the duplicates were greater than was expected and would seem to warrant the Library in continuing to prepare lists of them for distribution to the State agricultural colleges and experiment stations. A large number of duplicates have accumulated since the preparation of the list in October, 1910, and a new list will be distributed some time during the coming fall. They consist in large part of Government, State, and society publications. The limited space available for handling and storing the duplicates has greatly hampered the work. It is difficult to spare the services of an assistant for this work, but the lack of storage room makes it imperative either to continue the present practice or to destroy the duplicates as they are received. The latter course seems scarcely justifiable, if any considerable number of them are of value to the agricultural colleges and experiment stations.

TRANSLATING.

During the year 464 foreign letters were referred to the Library for translation by the Library translator. In addition, 15 articles, comprising 104 pages, were translated.

MAILING LISTS AND EXCHANGES.

Since the above heading does not clearly suggest what this part of the Library's work consists of, it seems advisable to explain the work in some detail, as in previous reports. In addition to having on file in the Library copies of the foreign mailing lists of the bureaus, divisions, and offices of the department, the Library has charge of (1) the "Libraries List" (a list of libraries and institutions in this country and abroad to which are sent all the publications of the department); (2) the Library Bulletin list—that is, the list to which the Monthly Bulletin of the Library is sent; (3) the foreign mailing list for the Yearbook; (4) the foreign mailing list for the Farmers' Bulletins; and (5) the "Exchange List" (a list of libraries, institutions, officials connected with agriculture, and exchanges in foreign countries, to which is sent regularly the Monthly List of Publications of the department). The Library has no control over the lists of the bureaus, divisions, and offices—that is, it can not make changes in their lists without their authority—but it has direct charge over the other lists above mentioned, and is thereby able to make advantageous arrangements for exchanges. For the purpose of preventing duplication and to aid in obtaining exchanges, the Library also maintains a consolidated list, arranged geographically, of all the addresses on the above lists. It is also the duty of the Library, in cooperation with the Division of Publications, to attend to the miscellaneous requests from foreign countries for publications of the department. If the institutions or individuals making the requests are entitled to the publications, an order requesting them to be forwarded is sent to the Division of Publications. This arrangement has been very advantageous to the Library in obtaining exchanges. Requests from individuals who are rendering no service to the department and requests from institutions with which the Library has no interest in arranging exchanges are referred to the Division of Publications for attention.

During the past year there have been no changes of note in the work in connection with the mailing lists and the sending of department publications. There were certain changes which seemed advisable, namely, a revision of the mailing lists and a new comprehensive order in regard to the distribution of publications, especially in regard to the distribution to foreign countries, to replace the old orders issued several years ago, during which time conditions have changed. It was deemed advisable, however, to await the report of the committee on efficiency and economy in the department before making any changes. The report, as previously mentioned, was issued on June 30, 1911, and recommended certain changes in regard to the distribution of department publications. These changes, as far as they affect the Library, will be acted upon in the coming year, and it is hoped will better systematize the work. In this connection special mention should be made of one of the recommendations of the committee in its report on "Libraries," namely, the following:

That all exchanges received in return for department publications be regarded as the property of the main Library and be sent there to be catalogued. If required by the bureaus later, such exchanges could be lent in the usual manner.

While there has been from year to year an increasing willingness on the part of the bureaus and offices of the department to cooperate with the Library in the matter of exchanges, it is too important a

matter to be left to chance, and the Library has felt the need of a definite arrangement, such as is contained in the above order. It will better enable the Library to keep its files of exchanges complete, and will also be advantageous in enabling the Library to give information in regard to the publications received in the department.

BUREAU, DIVISION, AND OFFICE LIBRARIES.

This is the first report of the department Library to have incorporated with it the reports of the libraries of the various bureaus,¹ divisions, and offices of the department. (See Appendix 1.) In the case of some of the bureaus the reports on the work of the libraries have in the past been included in the printed reports of the bureaus, while in the case of others only typewritten reports have been prepared. It seemed advisable this year to publish the reports as a part of the Report of the department Library, as it was hoped that the information thus brought together would better enable the officials and scientists of the department to understand the problems connected with the administration of the Library, and to cooperate with the Library in solving them.

No separate reports on the library work of the Bureau of Animal Industry, the Bureau of Soils, and the Bureau of Biological Survey have been included. The Bureaus of Animal Industry and Soils are in the same building with the main Library, and therefore maintain no separate libraries.

During the past year there was deposited in the Office of the Solicitor a large number of the State session laws which had previously been filed in the main Library. About two-thirds of the law books belonging to the department Library are now filed in the Office of the Solicitor, in a room set aside for library purposes. It is estimated that the collection comprises approximately 800 volumes.

In connection with the following reports some general statements should be made. About one-third of the books belonging to the department Library are deposited in the bureau, division, and office libraries. Several of these libraries have accumulated, in addition, through gift and exchange, a considerable number of publications, for the most part Government and State publications duplicated in the main Library, which have not been considered a part of the department Library's collections. One of the questions to decide in this connection has been how far it is desirable for the bureaus to accumulate duplicates of such material, even though they may be obtained free.

The purchase of books and periodicals by the department for use in Washington is confined to the Library,² with the exception of the law books purchased by the Forest Service.³ The other bureaus, divisions, and offices have no funds available for the purchase of books and periodicals for use in Washington, but they are permitted to purchase them for the use of their laboratories and offices located outside of Washington. The work in connection with the purchase of books for field ⁴ use is in most bureaus attended to by the libraries of the bureaus, as will be noted from the accompanying reports.

¹ The report of the Weather Bureau Library is included in the Report of the Weather Bureau.

² For the law governing the purchase of books and periodicals by the department see United States Statutes at Large, vol. 30, p. 316.

³ The appropriation for the Forest Service includes \$500 for the purchase of law books.

⁴ Use outside of Washington.

The 18 library assistants employed by the various bureaus, divisions, and offices are paid from their respective appropriations. They have not (previous to July, 1911) been under the jurisdiction of the main Library, but it is believed that they have been in sympathy with its policies, for there has been hearty cooperation between the libraries of the bureaus, divisions, and offices and the main Library. It is probable, therefore, that there will be no radical changes as a result of the recommendation of the department committee on economy and efficiency that the library staff of the department be brought under the jurisdiction and supervision of the librarian of the department. The wisdom of this provision is that it insures cooperation and unity in the work in the future instead of allowing these to depend upon a happy combination of circumstances.

If any reorganization of the library work of the department is desirable, especially as regards the relation of the main Library to the libraries of the bureaus, divisions, and offices, past experience has seemed to indicate that it should be along the following lines, namely: To relieve the bureau libraries as much as possible of the business and routine work in order that they may devote their energies to their special field of reference work and to concentrate in the main Library the business connected with the acquisition of all books and periodicals, whether acquired by purchase, gift, or exchange. A very important part of the routine work to be considered in this connection is the work of cataloguing. At the present time the catalogue of the main Library contains cards for all the books acquired by the main Library by purchase, gift, or exchange, and in addition contains cards for a large part of the material acquired by the bureau libraries by gift. Some of the bureau libraries send to the main Library to be catalogued the material which they receive by gift, others catalogue it and send duplicate cards to the main Library, still others catalogue and file the material which they receive by gift and exchange, but do not furnish the main Library with records of it. Some of the bureau libraries also do considerable indexing of the material contained in their collections. Copies of these cards have not, as a rule, been sent to the main Library. The main Library, on the other hand, with a few exceptions, has not furnished duplicate catalogue cards to the bureau libraries. As a large proportion of the accessions are, however, catalogued on printed cards prepared by the Library of Congress and by this Library, the libraries of the bureaus, etc., have been able to obtain copies. The questions to be considered are whether the catalogues should be allowed to continue to grow as circumstances direct, or whether some definite policy should be adopted. Should all the cataloguing be done in the main Library and duplicate cards be provided for the libraries of the bureaus, etc., in those subjects in which they are especially interested, and should the catalogue in the main Library include all the cards contained in the catalogues of the libraries of the bureaus, etc., including cards for material acquired by the bureaus by gift and exchange? If this is not desirable or practicable, what is the ideal plan toward which we should work? These are important questions and should be settled in the near future.

APPENDIX 1.

REPORTS OF THE BUREAU, DIVISION AND OFFICE LIBRARIES FOR THE FISCAL YEAR ENDED JUNE 30, 1911.

LIBRARY OF THE BUREAU OF BIOLOGICAL SURVEY.

The care of the books in the Bureau of Biological Survey devolves upon an assistant, whose main duties are editorial. The library contains approximately 3,100 bound volumes and 4,200 pamphlets. They relate almost exclusively to mammals, birds, game protection, hunting, trapping, and geographic distribution. The serials and the collection of works on mammals are the strongest features of the Library. Only books needed in the work of the bureau are retained in the Library, and these are very frequently consulted, many being in practically constant use.

T. S. PALMER,
Acting Chief, Bureau of Biological Survey.

LIBRARY OF THE BUREAU OF CHEMISTRY.

The collection of books deposited in the Bureau of Chemistry numbers about 11,000 bound volumes and pamphlets, one-third of which (mainly public documents duplicating those in the main Library) belongs to the bureau. The remainder forms a part of the department Library and consists of works on chemistry, pure and industrial, with emphasis on food and drug analysis and the detection of adulterations, with some few volumes on physics, geology, and allied subjects. Although the bureau collection is at the disposal of the rest of the department, an effort is made to keep the books purchased at the request of the bureau on the shelves, and a "time-slip" system is maintained, by which such books are recalled to the bureau after two weeks when borrowed by the main Library. From the nature of the work done by the chemists, it will be seen that this is necessary, for works on analysis and the like must be within call at short notice. Each laboratory keeps the books pertaining to its work, and when these are borrowed they are returned as soon as possible to the laboratory, so that necessary works may be easily within reach.

The chemists are eager for the last word on this constantly expanding science, and for this reason the Library is on the mailing lists of about 16 foreign and domestic publishers to receive advance notices of books. This is necessary, both to recommend purchases to the department librarian for the bureau collection and to keep the branch laboratory¹ libraries up to date. Recommendations for the purchase of books are made to the librarian by the different laboratory chiefs in the bureau. Such recommendations are carefully considered, and every effort is made to examine the works in question to see if they are suitable for purchase before the requests for their purchase are forwarded to the department librarian.

The librarian reads cursorily all the journals received each day, and in this way often secures valuable additions to the Library in Government and trade publications which can be obtained free of cost.

About 400 periodicals are received regularly, the greater number of which are circulated in the bureau. Half of these are received from the main Library and the rest are gifts from the publishers. These gifts, which are trade papers for the most part, are a valuable supplement to the books in the Library, and represent the different industrial interests, such as the paint, paper, rubber, leather, oil, perfume, grocery, and drug trades. All the circulating journals are distributed at a regular hour daily and overdue notices are made up once a week to recall periodicals which have been retained over three days. Before circulation the periodicals are displayed in the reading room for several days.

¹ Laboratories located outside of Washington.

CATALOGUES AND INDEXES.

With the exception of some of the public documents, this collection is fully catalogued by a straight dictionary catalogue. The catalogue contains about 30,000 cards. It also contains many index references to articles in periodicals of interest in the work of the bureau, and also many entries of books along chemical lines in the other Washington libraries. The pamphlet collection is separately indexed by subject and arranged by author.

For several years an extensive index by subject and country has been made of foreign enactments in regard to foods and drugs which have appeared in official journals. The Library is now making a complete collection of the texts of laws enacted throughout the world upon the subjects of foods and drugs and also standards which have been proposed therefor. These are being translated into English and will be arranged, indexed, and kept up to date.

BIBLIOGRAPHICAL WORK.

The various problems of food adulteration call for the compilation of lists of references which the Library compiles. This means an exhaustive and systematic search through scientific literature for previous experiments which have been made with the material under examination, usually a preservative substance or coloring matter. The articles found are generally in foreign languages and must be translated, abstracted, and arranged in logical order, so that the compilation of such a bibliography means days of careful work. Short bibliographical lists are also occasionally called for in correspondence, and these can ordinarily be compiled from the bureau library catalogue.

CIRCULATION.

A daily record is kept of the number of books and periodicals lent and of the number of persons using the Library for reference. There are 250 men in the bureau who use the Library constantly. Statistics for the past fiscal year are as follows:

Year and month.	Books.	Periodicals.	Persons.
1910.			
July.....	597	1,330	623
August.....	705	1,471	777
September.....	702	1,513	670
October.....	889	1,560	911
November.....	813	1,282	737
December.....	926	1,788	811
1911.			
January.....	921	1,597	911
February.....	1,072	1,248	829
March.....	1,161	1,587	859
April.....	937	1,620	701
May.....	786	1,613	667
June.....	954	1,814	699
Total.....	7,563	18,423	9,195

BRANCHES.

Besides its active work for the bureau in Washington, the Library has in its charge 25 separate collections of books and periodicals placed in the branch laboratories throughout the country from Boston to Honolulu. The laboratories examining routine food and drug samples have similar collections, while the food-research laboratory, at Philadelphia, is strong in works on bacteriology and refrigeration, and the enological laboratory, at Charlottesville, Va., in books on wine and cider making.

All purchases for the branches are made under the direction of the bureau librarian, and all periodicals, about 250 in number, are circulated and prepared for binding by the bureau library. Requests for the purchase of books made by the chiefs of branch laboratories are carefully considered by the assistant chief of the bureau and the librarian, and often refused if the laboratory already has a standard work on the subject which gives the required

information. Thus unnecessary duplication is avoided. The accessions acquired in this way by the bureau have reached almost 6,000 volumes. Author cards are sent to the laboratories with the books, and a catalogue of these accessions belonging to the bureau is maintained in Washington. Often the persons in charge of these laboratory collections show considerable interest in arranging their books and the Library furnishes advice and model cards in these cases.

ANNE E. DRAPER, *Librarian*.

LIBRARY OF THE BUREAU OF ENTOMOLOGY.

SCOPE

The library of the Bureau of Entomology is composed of approximately 5,000 books and 7,000 unbound pamphlets and separates dealing almost exclusively with entomology. There are a few general reference books and a few general works in botany, zoology, and allied subjects, perhaps 350 volumes in all, besides a collection of the publications of the Department of Agriculture pertaining to the work of the bureau, and a fairly complete set of those relating to entomology issued by the various State experiment stations. Of this material about 1,500 pieces are more or less permanently charged to the workers in systematic entomology, and the remainder forms an excellent reference collection, very inadequately housed in one crowded room of the bureau's quarters.

Books are recommended for purchase by the department Library for the bureau collection at the suggestion of workers in the bureau upon the approval of the chief of the bureau. The aim is to obtain as complete a collection as possible of both American and foreign works on economic entomology, as well as all systematic works on American entomology and the more important foreign systematic works. Very expensive old books which are not needed for very frequent reference, but which it is most desirable to have available in the city, have been recommended to the Library of Congress for purchase. By this plan the more limited funds of the department Library have been reserved for material in more constant demand. Taken as a whole, the department's collection of entomological literature may be said to be the best in the country on economic entomology. On the systematic side it is not as strong, but it is a very good working collection.

USE OF THE LIBRARY.

The aim of the bureau has been to make its collection one for reference principally, therefore the books are circulated less freely here than in some of the bureau libraries. Owing, however, to the scattered offices it has been necessary to lend many books during the past year, and the circulation from August, 1910, to July, 1911, was over 3,500 volumes, of which about 450 were borrowed from the main Library and about 90 from other libraries both in and out of the city.

PERIODICALS.

About 140 periodicals are received regularly, 60 through purchase and 80 by gift and exchange. It has not been our policy to circulate the current periodicals. They are all available for reference in the Library.

CATALOGUES.

The Library maintains a dictionary catalogue of all books, pamphlets, and "reprints" relating to entomology contained in the department. Cards for "reprints" from entomological periodicals have been omitted, as the "reprints" are usually small and are indexed elsewhere, as in the Zoological Record, on the Concilium cards, and in the Entomologische Berichte. The catalogue now contains about 30,000 cards.

The Library has in addition a set of the Concilium Bibliographicum cards relating to entomology. This index now numbers about 37,000 cards. It is arranged according to the Concilium's scheme of classification, and is very useful in that it brings together in one place the greater part of the current periodical literature of entomology.

A partial set of cards issued by the Office of Experiment Stations indexing the State experiment station publications, namely those relating to entomology, is on file in the Library. The Library also keeps up to date an index begun years ago containing economic notes and out-of-the-way bits of information. Here may be found book, periodical, and newspaper references to insects attacking various fruits and cereals, articles on the habits of insects, on mimicry, flight, maternal affection, melanism, spread of disease, etc.

REFERENCE AND BIBLIOGRAPHICAL WORK.

The demands upon the Library for help in locating and verifying references needed in connection with the preparation of the reports and bulletins of the bureau are constant. Short bibliographical lists are also frequently prepared by the librarian. During the past winter a great deal of time was given to the preparation of a bibliography of mosquitoes. The librarian makes and keeps up to date an index of articles one page or more in length in all publications of the bureau. This is of service in correspondence and in locating quickly descriptions of insects described by the bureau. The bibliography of economic entomology formerly compiled in the bureau was discontinued in 1905 on account of lack of funds for printing; it has not been possible to continue it recently, even in manuscript form, for lack of library assistance. Many of the bureau staff, however, compile very complete bibliographies in their own subjects which are available for reference. For example, the apicultural section has a very complete bibliography of the honey-bee and apiculture.

MABEL E. COLCORD, *Librarian.*

LIBRARY OF THE FOREST SERVICE.

There were added to the Forest Service library during the year 950 books and pamphlets, making a total of 14,963 in all. All of the books on forestry owned by the department Library are filed in the Forest Service library, with the exception of the older volumes of a few sets of foreign forestry journals not in frequent use, which are filed in the main Library.

By far the greater number of the new books acquired during the year have been free publications, received directly by the service. The Library has tried to procure copies of everything issued in this country on the subject of forestry. The Forest Service is on the mailing list of the State forestry officials, and therefore receives their publications regularly. A great many other miscellaneous forestry publications come to the service free or are obtainable for the asking. These generally find their way to the Library eventually, though not always. It is recommended that whenever such publications are received by the various offices of the service, they be sent at once to the Library, either for permanent filing or to enable the librarian to ascertain their titles and publishers, so that duplicate copies may be requested. It will then be possible to have a complete file in the Library of everything sent to the service on forestry subjects. All of the publications are classified and catalogued as they are received. The catalogue in the Forest Service library at present contains about 62,000 cards.

In regard to books recommended for purchase by the department Library for the use of the Forest Service library, it has been the aim of the library committee to recommend everything issued in English on the subject of forestry, all standard works on forestry in foreign languages, and any other foreign books for which there is some special need. In some instances books on other subjects than forestry are ordered when there is a constant demand for them. The resources of the main Library, the Library of Congress, and all of the other Government libraries in the city, however, are at the disposal of the service library; hence books which are wanted only temporarily are borrowed from one of them rather than purchased outright.

PERIODICALS.

The Library receives regularly 60 forestry and trade journals, either through the main Library by purchase or directly from the publishers. These are indexed as they come in, and the index cards are filed in the card catalogue. A number of the more important lumber journals are circulated throughout the

service to the offices especially interested. The current numbers of all of the periodicals are displayed in the reading room, as well as the new books received.

USE OF THE LIBRARY.

There have been borrowed from the Library during the year 4,447 books, an average of a little over 370 a month. Besides this, 2,928 persons have consulted the Library in person, or 244 a month. These figures do not show fully the use to which the library books are put, however, since several of the offices are charged permanently with books, of the use of which the Library has no record. The Office of Dendrology has the largest permanent allotment of books from the library, most of them being books which would be little used in the other offices of the service. The reading room has been found to be very useful this year, affording, as it does, a quiet place where the books may be consulted.

MONTHLY LIST OF CURRENT LITERATURE.

The monthly list of current forestry literature, including periodical articles, which was first issued in February, 1904, is still being prepared. Since May, 1910, it has been appearing in *American Forestry*, with the approval of the Secretary of Agriculture. Reprints of it are furnished to the Library by the publishers and are distributed to 80 persons, including members of the service and others who are interested in the subject.

MANUSCRIPT REPORTS.

During the year all of the district offices¹ have furnished the Library with lists of the manuscript reports in their files. These have been indexed on cards, by authors and subjects, and the cards filed in the card catalogue. The district foresters have also been requested to send in each month supplementary lists of the reports filed during the month, so that the index may be kept up to date. All of the manuscripts filed in the various Washington offices of the service are also indexed in the Library, the new ones being added once a month. The index cards show just where each report is filed, so that a person looking up a certain subject in the catalogue is able to locate not only the books and periodical articles about it but the unpublished literature as well.

BIBLIOGRAPHIES.

This Library is often called upon to furnish short bibliographies on specified subjects. As a rule these can be compiled from the references given in the card catalogue, though in some cases this is not sufficient, and the librarian has to compile them from other sources. As soon as the Appalachian bill was passed a bibliography on the resources of the White Mountain and Southern Appalachian regions was begun. As this has proved to be a much bigger undertaking than was at first expected, it is not yet completed, but will probably be finished this summer. Besides references to the literature dealing with the movement for national forest in the Appalachians, it aims to include as far as possible all books and articles dealing with the geology, mineral resources, physiography, water resources, forests, botany, climatology, and soils of the region. At present there are about 1,800 titles in the bibliography. A list of books on forestry in the Department of Agriculture, to be issued as a department Library bulletin, has been brought up to date, and is ready for the printers. It is hoped that funds for publishing it will be available in the near future.

PHOTOGRAPHIC COLLECTION.

There are now 25,098 classified and catalogued photographs in the collection, 1,846 of which were added during the year. An additional clerk was procured in May to work on the photographs, and it is expected that a much larger number will be worked up during the coming year. The new system of classification, which was begun in 1908, is being continued, and is found to work much better than the old watershed system. Under the present system, the pictures are first classified by States, and then subdivided by subjects. As soon as a

¹ Offices of the Forest Service outside of Washington.

picture has been classified, and the classification number assigned to it, it is indexed in the photographic card catalogue by specific subjects, such as names of species, lumbering operations, mountains and rivers, or whatever shows in the picture. While the present scheme of classification is such that in a great many cases it is not necessary to refer to the card index in selecting pictures, the index is found to be invaluable when pictures of special species or subjects are desired.

The present system of having each picture mounted on a cardboard mat, and filed in an upright position in drawers, while it requires more space for the filing, is on the whole more satisfactory than the album system of filing, as it enables a person consulting the files to take out quickly and easily just the pictures he wants, without danger of tearing them, and without having to take out a whole album when only one or two photographs are needed.

During the year the Library has furnished 8,293 descriptions, copies from the photographic notebooks, to accompany prints which have been made and sent out from the photographic laboratory. This includes descriptions for the duplicate prints which are sent to the district foresters' offices for filing, as the original notebooks containing these descriptions are filed in the Washington library. If some system of carbons could be provided in the photographic notebooks, so that a carbon copy of each description could be sent directly to the district forester concerned, by the man taking the pictures, it would save a great deal of copying in the Library.

FIELD LIBRARIES.¹

There are now 157 field libraries, 146 in forest supervisors' offices, 6 in the district offices, 3 at the forest experiment stations, 1 at the forest-products laboratory, and 1 in the office of wood utilization at Chicago. The district libraries average about 750 books apiece, and the supervisors' libraries about 88 apiece. The total number of books in field libraries at present is 17,933, of which 3,676 were sent out during the present year. Of these, the majority were free publications, either Government or State. The amount spent for the purchase of books for the field during the year was \$2,000. Purchases were made from this fund on the recommendations of the district foresters, with the approval of the library committee.

Before books are sent out to field libraries, they are classified and catalogued in the Washington library, and are then charged to the library to which they are to be sent, by the double-card charge system. Subject and author catalogue cards for the books sent to district libraries are also prepared in the Washington library, and are sent out with the books. On January 1, 1911, complete lists of the books in the district libraries were prepared and sent to the district foresters. This is to be done once a year in future.

HELEN E. STOCKBRIDGE, *Librarian*.

LIBRARY OF THE BUREAU OF PLANT INDUSTRY.

SCOPE.

When the Bureau of Plant Industry was moved into the west wing of the new department building, bringing under one roof offices of the bureau which had been widely scattered, the books which had been deposited in the Office of Botanical Investigations and those which had been in the Office of Vegetable Physiological and Pathological Investigations were brought together into one collection, containing at present approximately 5,770 books and 4,350 pamphlets. Of the bound volumes, about 1,554 are periodicals; of the pamphlets, about 1,260 are experiment station bulletins on the subject of plant pathology. The file of experiment station literature dealing with plant pathology is practically complete, but no attempt is made to keep the station literature on other subjects. With the exception of a few general reference works and dictionaries and reference works in chemistry and bacteriology, the collection consists almost entirely of works on general and economic botany, plant pathology, mycology, and pharmacology.

¹ Libraries outside of Washington.

USE OF THE LIBRARY.

About 1,200 of the books charged to the bureau are kept on the shelves in the library when not in use, the others being charged out permanently to the laboratories and offices in the bureau. How to care properly for the books so deposited, when used by a large laboratory force and by those from other laboratories, has been one of the problems difficult to solve, as the books are frequently taken from their places and no record left. The Office of Pathological Collections and the Office of Economic Collections, which have the two largest deposits of this kind, have recently cooperated with the library, to the extent of designating an assistant, who is to be responsible for the books and is to keep charges for those taken from their places. It is hoped that eventually this plan may be followed by all laboratories where there are any books permanently filed. Because of the large number of books deposited in laboratories it is considered necessary to take a yearly inventory. This is done in the spring or summer.

The books kept in the bureau library represent only a small proportion of those used by the force. Many are borrowed daily from the main Library, from other libraries in the city, and from out of town. The number of books circulated during the past year was 14,984, as compared with 15,114 in the previous year. This shows a decrease of 130 books for the year, but the decrease is probably more apparent than real, as several sets of periodicals which were formerly kept at the main Library have been brought to the bureau, with the result that they are consulted frequently in the library room, and therefore no record is kept of their use.

PERIODICALS.

About 550 periodicals are received by the Bureau of Plant Industry library. The circulation of the current periodicals is apparently greatly appreciated, and on the whole this privilege is not abused. Recently blanks have been provided for the purpose of informing the library of an individual's intended departure from the city and of his desire to have the sending of periodicals to him temporarily discontinued. It is hoped that these blanks will serve as a reminder that the Library wishes this information. During the past year the average circulation per day of current periodicals was 87, as compared with 75 in the previous year.

CATALOGUES.

Before the libraries of the Offices of Botanical Investigations and Vegetable Physiological and Pathological Investigations were combined each had its catalogue, both of which are now in the reading room of the bureau library. As the two catalogues have been described in detail in a recent circular (No. 87) of the Bureau of Plant Industry they will not be described here.

DUPLICATES.

The Library receives daily duplicates of department and station literature, and of periodicals and separates, which come by mail to the various offices of the bureau. The department duplicates are sent to the document section, the station duplicates to the Office of Experiment Stations. The periodical duplicates are listed, the list being sent to the main Library, where it is incorporated with the list of duplicates to be sent to the agricultural college and experiment station libraries.

REFERENCE AND BIBLIOGRAPHICAL WORK.

In addition to the circulation and care of books, the Library does reference and bibliographical work, especially verifying and editing bibliographies which are to be included in bureau publications. In this connection the Library has felt the need of an established bibliographical form for department publications.

BOOKS BOUGHT FOR OUT-OF-TOWN STATIONS.

The bureau library keeps the records of all books bought from bureau funds for out-of-town stations. Books bought on requisition are delivered to the Library, where they are recorded and labeled with a bookplate, showing by what office they were bought and to what station they are to be sent. In the cases of

the stations having a considerable number of books deposited, short author cards are sent with the books. When there are only a few books this is not considered worth while. Records of the books bought in the field¹ on letters of authorization are sent to the Library from the Office of Records. Periodicals are sent directly to stations, and therefore no record can be kept of the individual numbers.

EUNICE R. OBERLY, *Librarian.*

LIBRARY OF THE BUREAU OF STATISTICS.

The statistical branch of the department library, devoted primarily to statistics of agriculture and cognate industries and domiciled in the Bureau of Statistics, on June 30, 1911, contained 8,034 bound and unbound volumes, 1,283 pamphlets, and was receiving, by exchange or purchase, 234 daily, weekly, or monthly periodicals. This branch now possesses practically all important statistical reports relative to foreign and domestic agriculture and an extensive collection of publications relating to the foreign and domestic trade in agricultural and other products. During the year the system of charging in use in the main Library has been adopted and the preparation of a dictionary catalogue of all volumes is well toward completion. Access to the contents of the branch library is further facilitated by the maintenance of a card index by subjects and countries.

CHAS. M. DAUGHERTY,
*Chief, Division of Research and Reference,
Bureau of Statistics.*

DAIRY DIVISION LIBRARY.

SCOPE.

The library of the Dairy Division of the Bureau of Animal Industry is a small working collection of volumes and pamphlets in actual and constant use by the employees of that division. Owing to its limited quarters and to the fact that it is located in the same building with the main Library, every effort is made to conduct it strictly as a branch or station of the main Library, and no effort is made to accumulate on its shelves more material than is in actual demand. Works of purely historical or collateral interest have been returned to the main Library, from which they can be drawn at any time. All gifts to the division, whether in the form of books or periodicals, are presented to the main Library unless copies have already been received there. After being accessioned and catalogued they are filed in the dairy library if necessary.

The collection now comprises about 386 volumes, of which 242 volumes belong to the main Library and relate chiefly to dairying, feeding, and breeding. The other 144 volumes, which are duplicated in the main Library, belong to the dairy division and are chiefly herdbooks of the various dairy breeds and copies of Government publications. Most of the 1,300 pamphlets owned by the division library are bulletins of the various State experiment stations dealing with dairying. These bulletins are bound in temporary covers, classified by States, and are catalogued both as separates and as serials.

ADDITIONS TO COLLECTIONS.

Additions to this collection are made through gift and by purchase by the main Library. All new books on the subject of dairying, whether recommended for purchase by this division or otherwise acquired by the department, are sent here on request for review. A list of all books recently added to the main Library bearing even indirectly on dairying is posted periodically in the division library, and from this list any requests may be made. Books from the Library of Congress and the Surgeon General's library are frequently borrowed through the main Library.

PERIODICALS.

About 198 periodicals are received by the Dairy Division library, most of which are drawn from the main Library, others being received direct from the publishers by gift. The latter are all duplicates of periodicals received in the main Library. All of these periodicals are circulated among the workers of

¹Outside of Washington.

this division, the number of readers of each periodical varying from 1 to 14. All articles believed to be necessary in future work are marked by the readers and are afterwards indexed in the division library. Only 28 periodicals are filed in this division, all others being returned to the main Library as soon as indexed.

INDEXING.

The regular dairy index, so called, which is maintained in the Dairy Division, aims to be a practical working index of material of actual use in the work of the Dairy Division. Its entries include books, bulletins, articles in periodicals and other listed information, as dates and places of the various meetings of the International Dairy Federation, addresses of manufacturers of milk-condensing machinery, and other such information as is in constant demand and may be appropriately grouped on a subject card. The index is occasionally run through and cards no longer of actual use are discarded.

There is in addition to this an index of material on bacteriology in its relation to the dairy industry. This index was the result of many years of private endeavor of one man, and while in constant use in the dairy laboratories could be withdrawn at any time by the resignation of its owner. About two years ago this index was verified and revised by the Dairy Division library, the corrected cards being returned to the owner and copies being filed in the Dairy Division library. This index is now being kept up in duplicate, it being estimated by the library that the work done for the individual is by no means commensurate with the material obtained from him.

An additional index on gas-producing bacteria, which might be considered the amplification of one section of the catalogue mentioned above, is now being revised in a similar manner and is being extended by further references wherever found. An index to literature on enzymes is being compiled in the dairy laboratories in direct connection with their work, and it is expected that this material will ultimately be verified by the library and put into the same form as the other indexes in the division. It is hoped that in time all the library copies of these indexes may be consolidated.

Indexes to photographs, lantern slides, and bromide enlargements owned by the Dairy Division are also maintained by the Library. The photographs are indexed by number, for inventory and office purposes, by States and by subjects. The last two are not exhaustive, but include only entries of the more important photographs.

Lantern slides are also indexed by number and by subject, the latter index not being exhaustive. The bromides are indexed by number only.

A further statement in regard to the photographic work will be found elsewhere in this report.

REFERENCE WORK.

The demands on the Library for reference work vary greatly during the year, according to the character of the work being done by the division. It includes the collection of material for addresses, reports, letters, publications, etc. Frequently this material can be easily located or listed from the card catalogue, but new questions are continually coming up and further research is necessary. Other indexes in the department are used whenever possible and much time is saved in this way. For instance, when the subject of sewerage, drainage, and septic tanks was taken up by this division in connection with creamery and farm buildings, it was found that the library of the Bureau of Plant Industry has many of the most useful periodical articles already indexed in connection with the work of that bureau on water pollution. There are kept on hand for use in correspondence small supplies of carbon copies of brief bibliographies on subjects of pressing current interest, such as results of State work on milking machines, proposed legislation on oleomargarine, lists of dealers in creamery supplies, etc.

PUBLICATIONS.

All bibliographies for Dairy Division publications are sent to the division library for verification and to be put into the accepted bureau form. Occasionally authors leave the compilation of the brief bibliographies appended to their bulletins to the librarian, when most of the published material which they have used has been selected through the division library catalogue. In such cases the bibliographies are submitted to the authors for final review.

The completed manuscript of all Dairy Division publications, as well as all manuscript sent to the division for review, is recorded in, and transmitted through, the division library. This includes entries covering all successive steps before the publication is issued.

The library is also charged with making all requisitions for the distribution of Dairy Division publications in connection with correspondence or in the original distribution, and with the care of publications used in office work.

CARE OF PHOTOGRAPHS AND SLIDES.

This work, which is also done in the division library, consists of the mounting, labeling, filing, and indexing of photographs; the labeling, filing, and indexing of lantern slides; the mounting and indexing of bromide enlargements; and the circulation of lantern slides both in and out of the department. Duplicate sets of the slides most in demand are filed in small cases and kept in circulation among our field men, each change being recorded in the library charges. The photographic collection now consists of 4,044 mounted prints, 1,960 lantern slides, and 282 bromide enlargements. The library is charged with the making of all requisitions for photographic work (with the exception of blue prints) and with the receipt of the finished work.

A detailed statement in regard to the photographic indexes has already been given in this report.

FIELD LIBRARIES.¹

One small field library is maintained by the Dairy Division, its books being purchased from the Dairy Division appropriation. It now consists of 69 such purchased volumes and about 40 bound Government publications. These books are received by the division library when purchased, there collated, stamped, and listed before being sent to the field station. A few single copies of books are filed with certain field men in isolated places and are considered bureau property. It is required that an inventory of these out-of-town books be forwarded to the division library once each year.

CAROLINE B. SHERMAN, *Librarian*.

LIBRARY OF THE OFFICE OF EXPERIMENT STATIONS.

The library of the Office of Experiment Stations has avoided the collection of a greater number of books than is imperatively demanded for the work of the office. The utmost possible advantage is taken of its proximity to the main Library, whose resources are so extensively used as to free the office library from the necessity of maintaining a catalogue or of keeping upon its shelves a large number of books. The office maintains a collection of the publications of the State experiment stations, which is probably the most complete set of its kind in existence. This, together with a somewhat less complete file of publications of the Department of Agriculture, constitutes practically the entire office library, and affords a complete record of American agricultural experimental work for the use of the office force and for others who wish to consult it. As these volumes are rarely permitted to go into circulation outside of the building, and are at all times readily accessible, this set practically supplements that of the main Library, which necessarily circulates constantly. A very few reference books, charged by the main Library, and current files of about 50 periodicals are kept in the office library. About 120 periodicals and a number of reports and occasional publications of agricultural institutions are received by exchange. After circulation in the office, these are sent immediately to the main Library, or, in the case of a few which duplicate main Library sets, they are kept for a year or more in the office library.

The work of the office library is closely related to, and in a measure determined by, that of the Experiment Station Record. In the interest of this publication all accessible current literature is searched for records of original investigation or experimental work that may bear upon agriculture. Daily examination is made of books and periodicals received by the main Library, and those suitable for purposes of review or of special interest are brought to the attention of the editors concerned. Examination is also made of proof

¹ Libraries outside of Washington.

sheets of printed cards issued by the Library of Congress, by which means new books of agricultural interest received by that library and by the Geological Survey and by the Bureau of Education are made available for the use of the office.

In addition to the 120 periodicals received directly by the office, 435 are received regularly from the main Library, each number of which is regularly sent to from 1 to 12 persons. Each editor receives regularly those publications most closely related to his work, and, in addition, special articles in other publications are called to his attention. No statistics have been kept, but a conservative estimate indicates that about 125 publications are examined daily and about 200 are circulated. A considerable amount of reference work is also accomplished. Assistance has been rendered to libraries of the State agricultural colleges and experiment stations in completing sets of station publications.

Publications of the State experiment stations and of the department are collected and bound for the experiment stations of Alaska, Hawaii, Porto Rico, and Guam, as well as for the office library. During the fiscal year of 1910, 542 volumes were prepared and sent to the bindery.

E. LUCY OGDEN,

Assistant in charge of the Library.

LIBRARY OF THE OFFICE OF PUBLIC ROADS.

The library of the Office of Public Roads consists of about 3,000 volumes, a large part of which have only recently been added to the collection. Besides the strictly scientific works, which are purchased by the main Library for the Office of Public Roads library, the latter is now receiving the publications of all State highway departments, geological surveys, agricultural departments, and experiment stations, as well as those of various other State organizations which publish statistical information or data concerning highway activities within the States. The Library is also on the mailing list of the engineers of all cities of the United States having over 5,000 inhabitants and issuing any information concerning paving materials and operations in their jurisdiction. The State Department has requested all American consuls to have the name of this office placed on the mailing lists of all Governments which issue reports that might be interesting to our scientists, and in exchange the office is listing such organizations to receive its publications as they are issued. The number of periodicals regularly received at this office is 60, of which 29 are received from the main Library and 31 direct from the publishers.

The Library has never been fully catalogued, but every effort is being made to hurry this work, which has necessarily been retarded by the recent acquisition of several hundred volumes.

The Library has, besides its catalogue, a serial index and an index to periodical literature. It is not unlikely, however, that the latter may have to be suspended for a time, because of the pressure of other business. This index has proved to be one of the most useful sources of information in the Library, and has been consulted more than any other. Aside from the indexing of periodicals, no bibliographical work has as yet been undertaken by the library, but the librarian is at present engaged in preparing a bulletin containing a digest of the reports of American consuls concerning road conditions and work in foreign countries.

The librarian of the office also acts as editor, proof reader, and translator for the office. The mailing list of the office is in charge of the Library, and the librarian attends to the correspondence in connection with the publications.

WM. W. SNIFFIN, *Librarian.*

APPENDIX 2.

REPORT OF THE COMMITTEE ON EFFICIENCY AND ECONOMY IN REGARD TO LIBRARIES.¹

Organization.—There is a main Library, in charge of the department librarian, and there are branch libraries in all bureaus except Animal Industry, Soils,

¹ From the Report of the Committee on efficiency and economy in the Department of Agriculture, pp. 47-49

Accounts, and Publications. The Weather Bureau has a library, but is not a branch of the main Library. The department librarian has no supervision over the employees of the branch libraries, but is charged with the purchase of all books for the use of the department for the District of Columbia.

Personnel.—There are 39 clerks engaged in this work whose aggregate salary amounts to \$45,460. In the Bureau of Biological Survey one clerk gives one-third of his time to the work at an estimated salary of \$400. In the department Library there are 17 clerks employed at an aggregate salary of \$18,540.

Number of volumes.—There are approximately 135,898 bound volumes in the main Library and the various branch libraries of the department, and their value is estimated at \$401,550; also 65,410 unbound volumes, having an estimated value of \$27,755, making a total of 201,308 volumes, at an estimated value of \$432,305.

Character of volumes.—The books in the main Library are all scientific and technical in character, relating to agriculture in the broadest sense of the term and all cognate subjects. The branch libraries are composed of scientific and technical publications relating more or less directly to the scientific subjects in which the bureaus are particularly interested.

There are no books of fiction in any of the libraries of the department.

RECOMMENDATIONS OF THE COMMITTEE.

The following recommendations are made:

(1) That all surplus and duplicate books not required for frequent use in the bureau branch libraries be turned over to the main Library of the department, and that only small working libraries be maintained in the various branches, with the exception of the Weather Bureau and the Forest Service. The size of a particular branch library and the number of books to be carried therein should be left to the chief of that bureau and the librarian of the department, in order that the work of the bureaus may not be crippled by undue restriction of the branch libraries.

(2) That the librarian of the department be consulted in regard to all library appointments in the department, and that there be centralization of administration whereby all the branch libraries and the force engaged strictly in library work of the department will be brought under the jurisdiction and supervision of the librarian of the department, with the exception of the Weather Bureau and the Forest Service. This, however, does not contemplate a transfer of the library force of each bureau to the rolls of the main Library.

If the plan for centralization of administration be adopted, the librarian of the department will be able to get a more comprehensive view and make a fairer estimate of the needs of the bureaus and will be in a better position to judge of the necessity of maintaining large or small collections of books in the bureaus. If all the library work of the department were under one administration, it would also be possible to detail assistants from the main Library to the bureau libraries and from the bureau libraries to the main Library, which would result in greater familiarity on the part of such librarians with the resources of the Library and a better understanding of the work and needs of the department as a whole. At present a bureau library is too apt to emphasize its own needs and minimize the needs of other bureaus, while the main Library, on the other hand, is not brought into as close touch with the work of the bureaus as the bureau libraries are, and therefore does not always fully know their needs. This tendency on the part of the bureau libraries and the main Library toward a one-sided view can only be corrected through a better knowledge on the part of each of the needs of the other, and it is believed that this can only be remedied through centralization of administration. As the Weather Bureau and the Forest Service are at some distance from the main department, it is believed that these two libraries should be conducted as independent libraries so far as any supervision over the personnel or library work by the librarian of the department is concerned.

(3) That an inventory be taken of the books in each library at least once in every three years.

(4) That the librarian of the department formulate rules and regulations for collecting the value of books when lost.

(5) That the librarian of the department formulate rules and regulations for a uniform system of cataloguing and charging books throughout the department.

(6) That the index of veterinary literature now maintained in the Bureau of Animal Industry be transferred to the department Library and the force at present engaged thereon be placed under the jurisdiction and supervision of the librarian of the department.

(7) That, in so far as practicable, bibliographical work and indexing (other than the indexing of department publications) be done by the Library of the department.

(8) That all exchanges received in return for department publications be regarded as the property of the main Library and be sent there to be catalogued. If required by the bureaus later, such exchanges received could be loaned in the usual manner.

APPENDIX 3.

CIRCULATION OF CURRENT PERIODICALS—RULES AND SUGGESTIONS.

(1) Periodicals should be glanced over as soon as received, in order to ascertain whether or not the numbers contain any items of interest. If they contain nothing of interest, they should be returned immediately to the library from which they were borrowed.

(2) No number of a periodical in regular circulation should be kept more than three days.

(3) Periodicals must not be passed from one person to another without notifying the library from which they were borrowed, in order that the charge record may be changed. Persons to whom the periodicals are charged are held responsible for them.

(4) Numbers containing continued articles should not be held awaiting the receipt of the concluding article. When the number containing the conclusion of the article is received, the previous numbers may then be requested.

(5) Persons to whom periodicals are sent regularly are requested to notify the library when leaving the city for more than three days, in order that the current numbers may not accumulate in their offices during their absence.

(6) Persons receiving periodicals regularly are requested to go over their lists carefully for the purpose of eliminating any periodicals which contain little or no material of interest in their work. In the case of those which are requested for a limited length of time while special work is being carried on, the library should be notified when the work is completed, in order that the sending of these periodicals may be discontinued. The work of circulating current periodicals is very heavy and the regular circulation should be strictly limited to those of real importance in the various lines of investigation being carried on by the department. In this connection attention is called to the fact that the main Library maintains a periodical reading room (room 30), where the current files of about 800 periodicals may be consulted.

APPENDIX 4.

RULES FOR INTERLIBRARY LOANS.

Attention is called to the following rules of this library in regard to interlibrary loans. A strict observance of these rules on the part of librarians and scientists and a critical elimination of all unimportant and unnecessary requests will greatly facilitate the work and lessen the expense and risk involved in such loans.

(1) Books are lent to other libraries for the use of investigators engaged in serious research, in cases where such lending will not interfere with the work of the department. The material lent can not include books in frequent use in the department; books that should be in the local library; textbooks or popular manuals; nor books for use in ordinary student or thesis work.

(2) Unless otherwise specified, books are lent for one month, including time en route.

(3) The borrower is responsible for the safe return of the books and is expected to make good any losses or injuries which may occur. Books must be carefully wrapped when returned so that there will be no danger of injury to book or binding.

(4) Cost of carriage must be borne by the borrower. Books will be forwarded by express (charges collect) whenever it is deemed necessary on account of their size or value. Certain books, however, may be sent by registered mail if the cost of postage and registration be remitted in advance. In the case of books lent for use in the official work of the State agricultural colleges and experiment stations, those which it is considered safe to send by mail will be forwarded under the department frank, and a frank will be sent for their return. The cost of registration for the return of the book must, however, be paid by the borrower.

(5) It is preferred that requests from agricultural colleges and experiment stations be made through the college or station library, if the library is so organized as to be able to attend to such loans.

(6) Borrowers are urged to give as full a reference as possible when requesting loans, including author, title, and page of articles in periodicals. This is desirable for the following reasons: The article can sometimes be supplied in separate form; the volume of the periodical may be unbound, in which case only a single number need be sent; references are sometimes incorrect, and information as to the author and title of the article may prevent the sending of the wrong volume; if the article is short and the volume large, it may be more economical to have the article copied.

REPORT OF THE DIRECTOR OF THE OFFICE OF EXPERIMENT STATIONS.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., September 15, 1911.

SIR: I have the honor to present herewith the report of the Office of Experiment Stations for the fiscal year ended June 30, 1911.

Respectfully,

A. C. TRUE, *Director.*

HON. JAMES WILSON,
Secretary of Agriculture.

INTRODUCTION.

The work of the Office of Experiment Stations during the last year included, as heretofore, the supervision of the expenditures of Federal (Hatch and Adams) funds by the agricultural experiment stations in the several States and Territories; conferences and correspondence with station officers regarding the management, equipment, and work of the stations; the collection and dissemination of information regarding the progress of agricultural education and research throughout the world; the management of the agricultural experiment stations in Alaska, Hawaii, Porto Rico, and Guam; the promotion of the interests of agricultural colleges and schools and farmers' institutes in the United States; special investigations on irrigation and drainage largely in cooperation with experiment stations, educational institutions, and other agencies; and the investigation of problems relating to the utilization of agricultural products as food for man.

The progress and present status of these different lines of work are briefly reviewed below.

RELATIONS WITH AGRICULTURAL EXPERIMENT STATIONS.

The work and expenditures of the experiment stations continue to increase in volume and in variety, and as a consequence a greater amount of attention from this office is required. This increase in station affairs is the natural result of the better financial conditions in which these institutions are placed through the increased Federal funds and other resources. The Adams fund has now reached its maximum and is equal to the Hatch fund, and many of the States

are meeting the needs and requirements of their stations by granting substantial appropriations not only for their maintenance but also for definite lines of investigation. The growing demands of a progressive agriculture and the generally better financial status of the experiment stations tend to enlarge their scope of action, increase their capacity, and multiply their lines of work. This greater development of the institutions demands a more careful consideration relative to the expenditure of the different funds over which the stations have control in order to determine the policy pursued in the use of the Federal funds. In this connection numerous questions arise with regard to the legitimate and most effective use of these funds for experimental and research work.

The multiplicity of station duties, coupled with their greater and varied resources, has involved a closer inspection and a stricter adherence to the policy of restricting the Federal funds to actual experimental work. As the law demands that the Federal funds shall be used chiefly for experimental and research work, it is practically imperative that the stations should have some other revenues upon which to draw for administrative needs, printing, and those lines of work often demanded by the State, such as inspection, demonstration work, and other duties which evidently can lay no claim to being financed, even in part, from the Federal funds.

The policy of the office in relation to the Hatch and Adams funds is resulting in a more careful arrangement of the budget by the station officials and the boards of control. It is observed that when the budget is carefully arranged there is now little or no deviation throughout the year from the plan as outlined. When the needs of the different departments of the station are not previously considered the funds are frequently unevenly expended or used in enterprises which do not give the most useful results.

The apportionment of salaries in cases where station officials have also college duties requires continued supervision. The proper apportionment of salaries requires the close scrutiny of the station director, who should make the arrangement with the president of the college before its submittal to and approval by the board of control.

In the approval of Adams fund projects the experimental work proposed and submitted has been subjected to more searching scrutiny, which has led to a more extensive correspondence regarding the work before it is entered upon, in order to arrive at a full understanding with reference to methods, objects, and purpose of the proposed investigation, and for the purpose of placing the work on the proper basis. The policy in relation to the kind of projects approved has been more rigidly enforced that the work submitted must be definite, restricted, and specific. The experience of the past five years has clearly shown the inadvisability of accepting blanket projects, or propositions too wide in scope or too indefinite in purpose or method. As a rule where the project has not been restricted and held to the definite proposition the work has been superficial and scattering and has lacked directness and objectiveness. Every reasonable effort is therefore being made to hold the use of the Federal funds within the terms of the law, and to restrict expenditures from the Adams fund to necessary expenses directly connected with definite research projects of high grade.

Dropping projects before their completion is one of the greatest drawbacks to progress of work under the Adams or research fund. When projects are discontinued special inquiry is made with regard to the reason therefor, and if deemed feasible it has been urged that the work be brought to a definite conclusion. These discontinuances of lines of investigation result in reality in a waste of money, and arise mainly from changes of men on the station staffs and from the failure of the station management to fully appreciate the necessity of systematic continued work.

There probably has never been an attempt to supervise so large an amount of investigation as the Adams fund projects of the experiment stations. The legality of the expenditures is so largely dependent on the character of the investigation that the supervision of the funds requires much careful study of the investigations as far as their character, original features, and continuity are concerned.

This is a very large undertaking, with 48 States and Territories each receiving \$15,000, or a total of \$720,000, and with a list of approximately 290 projects, of which 21 were completed during the past fiscal year and 43 were approved and entered upon. The situation is often complicated by the partial support of projects from other funds, and by the extent to which the Adams fund is divided among relatively small undertakings and a large number of workers.

The rapid expansion of the work of the stations in various directions has in some cases put too heavy administrative burdens on the directors, and has brought into their service many comparatively young and inexperienced investigators or men with comparatively limited scientific training. To this must be added the fact that the relative newness of agricultural science and the complicated character of most of its problems make the clear differentiation of specific problems for research relatively difficult. Thus questions often arise as to what the problem really is and what is involved in its investigation. This office is therefore often called upon to go beyond what would be required by a formal administration of the Adams Act and to act in an advisory way regarding the planning and execution of research. In doing this it endeavors to give the stations the benefit of its broad study of the world's literature of agricultural science and its knowledge of the conditions under which agricultural research is being conducted in many institutions.

In addition increased attention has been given to the Hatch fund and to the sales fund derived from the two Federal funds. These, it is maintained, should be devoted as far as possible to definite experimental work and not be absorbed in paying the administrative and general running expenses of the stations. They should also not be used for demonstrations or other forms of extension work for which there is now such a widespread demand, but which should be provided for in other ways. It is impracticable to formulate definitions covering all questions regarding the division and use of the Federal funds which may arise from time to time, but the office is endeavoring to assist the stations in working out the best methods of using these and other funds at their disposal.

The publication of the records of investigation remains a question of much importance. This office maintains that the records of station work are to be recognized as the property of the particular station

at which or for which the work was done. There has been some laxity in the matter of recognizing this principle, and in a number of cases records have been carried away from the station by the individual worker on severing his connection with the institution. Whenever it has been the intent to appropriate such material and to use and publish it at an experiment station in some other State, the office has refused to approve a project based upon such action without the consent of the station where the work was originally done.

The lack of a suitable place for the publication of results of investigation in technical detail still continues. In numerous instances station workers have published in scientific journals in this country and abroad such technical results as they did not consider advisable to publish in the ordinary station bulletin. Among the stations better provided with funds a number have inaugurated the publication of a series of technical or research bulletins, and while this relieves the situation to a certain extent it does not adequately provide for bringing the results to the notice of the interested public, even in so far as these particular institutions are concerned. The coming of the Adams fund tends to complicate the situation, inasmuch as it provides much work of a technical character, while at the same time the fund can not be used for publication. The results of this work, in many cases, demand presentation in detail from a strictly scientific point of view. Provision for the proper and adequate publication of such technical matter as is worked out by the station investigators throughout this country would not only be a direct encouragement to every station worker, but would also bring the scientific world in touch with the research features of our experiment station system, and would give to it the standing in the realm of science to which it is clearly entitled.

The detailed review of the work and expenditures of all the stations for the fiscal year 1910, published in the annual report of this office for that year, contains many evidences of substantial progress in research and the accumulation of useful practical results. The same is true of the similar review for the year 1911 now being made by the office. On the whole, the American experiment stations are steadily strengthening their organization and their work. The volume of results strictly beneficial to our agriculture is constantly swelling. The number of farmers and horticulturists who are taking advantage of the work of the stations is now very large, and each year brings additional evidence of the increasing esteem in which practical men hold the institutions devoted to scientific study of the problems of agriculture.

RELATIONS WITH INSTITUTIONS FOR AGRICULTURAL EDUCATION.

In my report for 1910 I called attention to the rapid development of public interest in the broader phases of agricultural education and to the evidence that the right solution of the problems of country life and agricultural production will depend very largely on an effective system of practical education which will reach the masses of men, women, and children on the farms. Reference was also made to the complexity of the problems involved in organizing

proper agencies for such education and the immensity of the task involved in reaching the millions of our rural population, to the lack of clearly defined relations between the National and State Departments of Agriculture, the agricultural colleges, schools, and experiment stations, and public and private schools, to the special problems constantly arising in different regions, and to the attempts now being made in many places to organize this work without taking into account the results of experience elsewhere. State and local officials and organizations, voters, and men and women interested in promoting the general welfare of our agricultural communities, are seeking light on the questions involved in the organizations of agricultural education.

For a number of years this office has endeavored to study these problems in a broad way, to collect information from many sources, and to spread abroad throughout the country definite information which would be of use to those who are engaged in the work of diffusing practical education in agriculture in the several States. Our work has been entirely inadequate to meet the situation.

A part of this work has been done through publications, but much of it requires personal touch with the communities and officers seeking our aid. Confining our efforts to giving aid to the State organizations and officers charged with the immediate responsibility for promoting this movement, we need a larger and more permanent force than can be maintained with the funds now at our disposal. Our agents for this service should be men and women with broad educational and practical training and with marked ability to present the subject clearly and effectively in publications, addresses, and conferences. Much of their success will depend on their continuance in our service after their ability for broad leadership in this enterprise has been demonstrated. The amount of money required to secure and maintain the needed force for such service as is appropriate for the Department of Agriculture to perform in promoting agricultural education throughout the United States is relatively very small. It is hoped, therefore, that a way will be found to provide such additional funds as will enable our agricultural education service to meet more fully the demands which the States and Territories are making upon it.

I recommend that at least \$10,000 be added to the appropriation for the work of this office in agricultural education for the fiscal year 1912.

The educational work of the office is divided into two sections, one dealing with agricultural colleges and schools and the other with farmers' institutes and other forms of extension work in agriculture.

THE AGRICULTURAL COLLEGES AND SCHOOLS.

The State legislation of the past two years and the appropriations made for agricultural education indicate pretty clearly that this country is definitely committed to the development and support of agricultural education in all its different phases and from the elementary grades up through the college and the graduate school. In some of the States this development is proceeding slowly, but in many more of them progress in this direction is as rapid as local

conditions will permit. The agricultural colleges have been working with larger funds than ever before and many of the State legislatures have provided even more liberally for their future activities. The enrollment of four-year college students in agriculture has increased, and the number of those taking teacher-training courses in agriculture was eight times as large in 1910 as in the year before.

New secondary schools of agriculture have been established; four more States have provided State aid to encourage the establishment of departments of agriculture, home economics, and manual arts in public high schools, making 10 that now give such aid; several States have increased their appropriations for secondary agricultural education; and hundreds of high schools have inaugurated work in agriculture without any special aid for the purpose.

Elementary instruction in agriculture has been greatly extended, particularly those phases connected in various ways with boys' and girls' agricultural clubs. In 11 Southern States there were over 46,000 members of boys' corn clubs; and if we count members of potato clubs, poultry clubs, swine clubs, garden clubs, domestic science clubs, and other organizations of this character, it is safe to say that 250,000 boys and girls were studying the elements of agriculture and giving practical application to their studies.

In an advisory capacity the agricultural education service of the Office of Experiment Stations is brought into close touch with all phases of this great forward movement in country life education. It has cooperated and conferred with institutions and organizations concerned with the promotion of agricultural education, prepared upon request courses of study for agricultural schools, and rendered expert services in connection with the inauguration of new agricultural school projects. This work has been in charge of Mr. D. J. Crosby, specialist in agricultural education; Messrs. F. W. Howe, C. H. Lane, and B. B. Hare, assistants in agricultural education; Miss M. T. Spethmann, in charge of statistics and the review of foreign literature on agricultural education; and Miss M. A. Agnew, in charge of the card directory of teachers and investigators in agriculture and of the organization lists of agricultural colleges and experiment stations. Mr. Howe resigned October 15 to accept a more lucrative position with the New York State Department of Education and was succeeded April 16 by Mr. Lane. Mr. Hare was appointed assistant in agricultural education and rural economics March 23, but thus far has devoted much more of his time to agricultural economics than to agricultural education.

In connection with the editorial work of the department of agricultural education in the Experiment Station Record, more than 1,700 foreign and about an equal number of American publications have been reviewed. In addition to the annual organization lists, statistics of agricultural colleges and experiment stations, review of progress in agricultural education, and lists of educational publications and institutions, there have been prepared and published special bulletins, circulars, and reprints concerning school exercises in plant production, school lessons on corn, agriculture as first-year science, and community work in the rural high school, and an article dealing with county schools of agriculture and domestic economy in Wisconsin has been submitted for publication. In cooperation with

the Forest Service a Farmers' Bulletin on Forest Nurseries for Schools was published, and a short course in forestry was conducted at the Agricultural School of Baltimore County, Md. A contour map of the grounds of this school was also made, and with the assistance of the Bureau of Plant Industry a planting plan combining the elements of a botanic garden and an ornamental plantation was prepared.

Studies of American and foreign agricultural schools have been continued. The card index of foreign schools now contains over 6,500 cards, and that of American schools over 8,600 cards of institutions and 900 cards of teachers of agriculture. A list of American colleges and schools teaching home economics was prepared and published in the *Journal of Home Economics*. The card directory of American teachers and investigators in agriculture has been revised and now contains about 2,400 names. This directory is maintained for the convenience of agricultural colleges and other institutions seeking trained teachers and investigators.

Cooperation with the Association of American Agricultural Colleges and Experiment Stations has been continued. The Director of this office has continued to act as bibliographer of the association, as chairman of its committees on instruction in agriculture, and on the history of agricultural education, and as dean of the Graduate School of Agriculture, the fifth session of which is to be held at the Michigan Agricultural College during July, 1912. The specialist in agricultural education helped to organize an association known as the American Association for the Advancement of Agricultural Teaching, which will hold its second meeting at Columbus, Ohio, November 14, 1911.

Numerous conferences and large agricultural gatherings have been attended, and at these and summer schools for teachers addresses on the work of the department have been given. In this work the agricultural education service of the office has been assisted by the Forest Service, the Bureau of Animal Industry, the Bureau of Plant Industry, and the Bureau of Soils. Such assistance is greatly appreciated by the people who ask for it, and it contributes materially to the advancement of agricultural education.

EDUCATIONAL WORK IN 1911-12.

It is proposed to continue the work of the agricultural education service along the same general lines. Plans have been made to cooperate with the Association of American Agricultural Colleges and Experiment Stations in making further studies of college courses in agriculture, and with the American Home Economics Association in formulating courses in home economics for colleges and schools. Plans have also been made to cooperate with the Forest Service in making additional investigations on forestry instruction, particularly with reference to courses in farm forestry in connection with agricultural courses in secondary schools, as well as in preparing educational publications relating to forestry. It is hoped that there may also be a considerable development of cooperation with the other bureaus of the department in educational work.

PLANS FOR 1912-13.

The demands upon the agricultural education service for expert assistance, for attendance at important State conferences to discuss plans for the promotion and organization of agricultural instruction in the colleges, normal schools, and high schools will almost surely increase. These demands grow out of a need on the part of State officials for information that can be gathered and properly interpreted better and more economically by some central Federal agency than by any local organization. It will therefore be incumbent upon this office not only to maintain its present organization for agricultural education, but also to employ additional specialists to make broader and more thorough investigations concerning the teaching of agriculture, the accumulation and use of agricultural illustrative material, the organization of systems of agricultural education, and the preparation of the data thus accumulated for publication, in order that each new project in agricultural education may have the benefit of the accumulated experience growing out of the development of other like projects in this country and abroad.

FARMERS' INSTITUTES AND EXTENSION WORK.

Reports were received during the past year from 44 States and Territories giving data respecting their institute work. In 41 of these, regular institutes were held to the number of 5,582; 3,723 were one-day meetings, 1,704 two days, and 155 three days or more.

The total number of sessions was 15,532, with an aggregate attendance of 1,904,676. If the States and Territories not reporting equal the sessions and attendance of last year, the aggregate number of sessions for the entire country will amount to 16,545 and the attendance to 2,074,099, as against 16,586 sessions in the previous year and 2,395,808 attendance, a falling off in sessions of 41 and in attendance of 321,709. This loss in attendance at the regular institutes was more than made up by the increased attendance upon special institutes, such as movable schools, railroad specials, independent institutes, etc. The special institutes aggregated an attendance of 1,252,933, making the entire attendance at institute meetings of all kinds 3,327,092, or 383,848 more than in 1910.

The special institutes are rapidly growing in importance and interest. One hundred and forty-nine movable schools were held with an attendance of 39,965; 62 railroad instruction trains were run, covering 35,705 miles, accompanied by 740 lecturers and attended by 939,120 persons. Four hundred and fifty-nine independent institutes were held, with an attendance of 130,917, and 15 round-up institutes, continuing through 153 sessions, attended by 22,730 persons. There were 303 picnics and conventions, consisting of 269 sessions, attended by 120,161 persons.

Of the total number of regular institutes held, 366 days were for women with an attendance of 47,962, and 199 days were for young people with an attendance of 25,737. Of the movable schools held, 208 days were devoted to institutes for women with an attendance in four States of 1,516, and 75 were young people's meetings with an attendance not registered except in one State, where it was 244.

The total number of lecturers listed on the State force was 1,011. The number from the faculties of the agricultural colleges and experiment station staffs was 319, and the days contributed amounted to 3,876. Thirty-six lecturers were in attendance 188 days at teachers' institutes, meeting 14,295 teachers of the public schools. Thirty-five lecturers gave 321 days to high-school work, meeting 31,030 persons. Nine lecturers were at normal schools 72 days, meeting 2,195 normal-school students. Twenty-nine lecturers gave 274 days to the public schools, meeting 39,684 scholars.

Fifty-three experts were employed as itinerant instructors and advisers by 14 States. Eight gave all of their time to this work and the others contributed 2,703 days. Twenty-five States had 25 experts engaged in other forms of extension work. Twelve of these were employed all of their time and the other 13 aggregated 686 days. The lecturers before teachers' institutes, high schools, common schools, and the itinerant experts and advisers in other forms of extension gave 6,664 days to teaching in these several directions.

Thirty-nine State legislatures appropriated \$347,850.57 to institute work; to this there was added by 18 States \$51,568.75 from other sources, making a total of \$399,319.32. There was expended by 39 States for institute purposes \$342,476.62. The State appropriation for 1912 in 33 States is reported at \$383,600.

These figures show that the interest of farming people in institute instruction is steadily growing and extending to embrace new and improved lines of effort. The movable school, the women's institute, the high school, the rural school, the instruction train, and the itinerant teacher have been operating and testing their methods as never before, and large numbers of farming people are being reached through these media.

The awakening of country people to the need of agricultural instruction and to the possibilities of extension teaching has created a demand for this instruction far beyond the power of the States to supply. The inadequacy of our present equipment for meeting the educational needs of rural people has become so apparent that several bills have been presented before Congress looking to additional appropriations for carrying on this work. The States also are adding to their appropriations for agricultural extension in very marked degree. California has increased from \$10,000 for institute work to \$15,000 per year; Illinois, \$23,650 to \$29,000; Kansas, \$27,500 to \$35,000; Minnesota, \$18,000 to \$23,000; Nebraska, \$10,000 to \$17,500; New York, \$25,000 to \$35,000; Ohio, \$22,000 to \$26,400; Oklahoma, \$5,000 to \$10,500; South Dakota, \$9,400 to \$13,000; Utah, \$5,000 to \$10,000; and Washington, \$8,500 to \$10,000. Comparing the 33 States reporting appropriations by their State legislatures for 1912 with the same States in their appropriations for 1911 the difference in favor of the coming year is \$65,179.61, an increase of over 20 per cent.

WORK OF THE OFFICE.

This office has continued to gather information along extension lines and has compiled and published much of it for the benefit of extension workers. Publications relating to College Extension in Agriculture, Proceedings of the Fifteenth Annual Meeting of the

American Association of Farmers' Institute Workers, Farmers' Institutes for Young People, List of State Directors of Farmers' Institutes and Farmers' Institute Lecturers of the United States, Agricultural Fair Associations and Their Utilization in Agricultural Education and Improvement, and The Transportation Companies as Factors in Agricultural Extension were issued during the year besides the Annual Report of the Farmers' Institute Specialist for 1910, a translation of the Agriculture of Belgium, 1885-1910, by J. M. Stedman, assistant farmers' institute specialist, and a revision of a bulletin on Legislation Relating to Farmers' Institutes in the United States. A number of addresses for conventions and institute meetings were also prepared. The farmers' institute specialist is secretary of the American Association of Farmers' Institute Workers, and as such has the preparation of the program for the annual meeting and the editing of the report of the proceedings. He is also secretary of the committee on extension work of the Association of American Agricultural Colleges and Experiment Stations and assists the committee in collecting information respecting that work. The correspondence of the office has likewise increased so as to require each succeeding year a larger portion of the time of the office force to conduct.

PUBLICATIONS OF THE OFFICE.

The office issued during the year 80 documents, aggregating 4,709 pages, not including 8 separates, a number of revised reprints, and a miscellaneous document, which aggregated 660 pages more. The publications included 18 numbers of Experiment Station Record, 15 technical bulletins, 2 reports of the office, 16 circulars, 5 publications of the insular stations, 10 Farmers' Bulletins, including 6 numbers of Experiment Station Work, 3 articles for the Yearbook of the department, and 12 monthly lists of station publications.

Following the plan of the year previous, Volumes XXIII and XXIV of Experiment Station Record were issued during the year. Each volume consisted of six monthly and two additional or, as they are termed, abstract numbers, together with the customary author and subject indexes.

As in previous years, the numbers have been made up largely of abstracts of agricultural literature, together with brief notes on the organization, equipment, and development of institutions for agricultural education and research in this country and abroad, and, in the case of the regular monthly numbers, of editorials and special articles on important phases of the progress of agricultural investigation and science. The abstracts have, as usual, covered the publications of the agricultural experiment stations of the United States and the United States Department of Agriculture, researches of experiment stations and similar institutions in all parts of the world, and a large number of articles having a direct bearing upon agricultural science and practice published in book form or in the domestic and foreign journals.

With the steady development of agricultural agencies the number of articles to be abstracted has continued to increase. The total number of abstracts included in the two volumes was 7,131, the largest number for any year and nearly 1,800 in excess of that of two

years before, when no abstract numbers were issued. Even this large increase, however, has proved inadequate to secure as prompt publication of accumulated material as is desirable. With a view to lessening the congestion, as well as to permit of a more complete review of the literature, arrangements have recently been completed whereby two additional abstract numbers will be issued annually. This has involved a change as to the date of issue of these numbers. Hereafter they will constitute Nos. 3, 6, and 9 of each volume instead of Nos. 4 and 8 as at present, and will appear at bimonthly intervals, beginning with August, 1911.

As time goes on the value of the Record as a great repository of information pertaining to agriculture, otherwise available only by an extended examination of the enormous mass of literature which has been published, continues to increase. The 24 volumes thus far issued contain references to no fewer than 85,829 articles, besides editorials, special articles, and notes. The experiment station reports abstracted have alone numbered 956, the station bulletins and circulars 7,956, and the publications of this department 4,488. The carefully prepared author and subject indexes to the individual volumes and the general index to Volumes I to XII have greatly enhanced the usefulness of the Record. Considerable progress was made during the year in the preparation of a similar general index for Volumes XIII to XXV.

An indication of the usefulness of publications such as the Record for the assembling, preservation, and dissemination of the results of the vast fund of agricultural knowledge which is accumulating is afforded by the recent establishment of a publication by the International Institute of Agriculture at Rome, with its announced purpose to "review without delay the scientific and technical, and in part the legislative, literature of agriculture and the allied industries," and to furnish "a periodical summary of the agricultural literature of the world." This publication, designated "The Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases," is issued monthly in both English and French editions, each number thus far containing about 200 pages. It is of interest to note that although the Bulletin at present gives more prominence to articles of a popular nature and of more immediate practical interest than has been deemed advisable in the Record, from which it also differs in many other important respects, it is understood to have been patterned directly upon it and to have followed many of its details.

A number of changes in the personnel of the staff engaged in the preparation of the Record occurred during the year. Following the resignation of Mr. J. B. Morman, for several years in charge of the abstracting in rural economics and of the indexing, these duties were divided, the indexing being intrusted to Mr. M. D. Moore and the work in rural economics to Mr. B. B. Hare. A portion of the abstracting in veterinary medicine was undertaken by Dr. L. W. Fetzer in addition to his previous duties in agricultural chemistry. Mr. B. W. Tillman was added to the staff in connection with the abstracting in soils and fertilizers, and Mr. C. H. Lane in connection with that of agricultural education.

As heretofore, the editorial management of the Record was in direct charge of Dr. E. W. Allen, assistant director.

The office continued to supplement the Record by a bimonthly review of progress in the more practical lines of investigation at the experiment stations in the Experiment Station Work series of Farmers' Bulletins.

The proceedings of the American Association of Farmers' Institute Workers were prepared and submitted for publication by the department through the office.

The office continued the publication of the card index of experiment-station literature. The total number of cards of this index distributed has now reached 31,400. The receipts from sales of the index during the year were \$250.77.

WORK FOR THE CIVIL SERVICE COMMISSION.

The director of the office has continued to act as the general representative of the department in matters relating to the examinations held by the Civil Service Commission for technical and scientific positions in the department. The number of papers received from the Civil Service Commission recorded in the office and rated by examiners in the department during the year was about 3,850, as compared with about 2,720 reported last year. Besides the regular examinations, 63 special examinations were held during the year, as compared with 38 last year.

INSULAR STATIONS.

An eminently successful year has been reported by each of the stations maintained by the office. A few changes in the personnel of some of the stations have been made, but there has been little interruption of the work. The policy adopted at the establishment of the stations of working for the diversification of agriculture remains unchanged.

Through local funds, contributed for the purpose, there have been several additions to the cooperative demonstration farms maintained by some of the stations. It is expected on these farms to present visual evidence of some of the more practical results of the stations' work, while the more technical experiments are carried out on the station proper. Some of the main features of the work of the different stations are briefly described in the subjoined reports.

All the stations are growing in the esteem and favor of the people for whom they are maintained. This is shown by the rapidly increasing growth in correspondence, in the demand for publications, and in individual requests for advice, the readiness to engage in cooperative work of all sorts, and the increasingly generous private and community contributions of funds. The scientific work of the stations is attracting wide attention, their publications being noted in the principal scientific review journals of the world, and in not a few instances permission has been given for the republication of some of the bulletins in foreign countries.

The several bureaus and divisions of this department continue to cooperate generously with the stations, supplying materials and information that are of great value and which the stations can not readily obtain for themselves on account of their isolation. It is desired to make proper acknowledgment here for this aid.

With the development of the stations the administrative work of this office continues to increase. The purchasing of materials, editing and publishing the bulletins and reports, correspondence, and other matters relating to the stations, require considerable time and attention. This work, as heretofore, was in charge of Dr. Walter H. Evans. All the fiscal affairs of the temporary disbursing agents in their relations with the Government are reviewed by the accountant of this office, and the satisfactory manner in which the accounts are handled has received hearty commendation.

During the past fiscal year the appropriation for the Alaska, Hawaii, and Porto Rico stations was \$28,000 each, and for Guam \$15,000. These sums were supplemented by sales and other funds which were available for maintenance and for the extension of the work as follows: Alaska, \$3,807.86; Hawaii, \$18,494.47; Porto Rico, \$2,382.81; and Guam, \$35.74.

ALASKA STATIONS.

The work at the agricultural experiment stations in Alaska has been carried out during the past year in accordance with the plans outlined in former reports. At Sitka horticultural and plant-breeding work are given prominence. At Rampart the principal work is in testing and breeding varieties of grain and in experiments with potatoes and hardy leguminous plants. Farming on a commercial scale as it must be practiced by settlers is carried on at Fairbanks, and at Kodiak breeding and care of live stock are the principal investigations. For the present this work is confined to cattle and sheep.

The work with hybrid strawberries at Sitka has been continued with marked success. Of the earlier hybrids produced by crossing the native strawberry of the coast region with a cultivated variety, nearly 200 have shown such valuable characters that they are being propagated and tested to determine their true value. About 35 varieties have already produced berries that exceed in size and flavor any of the cultivated ones found in the local markets. Continued efforts have been made to produce additional hybrids, and about 2,000 hybrid seedlings are now being grown at the station. These should begin to bear in two years and give some indication as to their value. In like manner the study of the crosses between the salmon berry and the cultivated raspberry is being continued. Thus far the hybrids have proved very shy bearers, and little judgment can be made as to their value. The station is continuing to propagate and distribute for trial a large number of fruit trees and bushes and some ornamental plants. These are furnished to settlers upon request, as far as the supplies will admit, and some are sent to the other stations, where the facilities for propagation are not as complete as at the main station.

Comparative tests of about 60 varieties of potatoes and of many varieties of cabbage, cauliflower, and other vegetables are being continued at the Sitka Station to determine which varieties are best adapted to the climatic conditions of the coast region.

At the Rampart Station uniformly successful efforts in growing barley and oats have been made, but with rye and wheat less favorable results have been secured. The normal growing season at this place is about 110 days, and in 1910 the maximum temperature was

in July, when 92° F. was attained, with a daily mean temperature of 61.1°. This gave sufficient warmth to ripen practically all varieties of spring-sown grains except wheat. Where rye and wheat were sown in the fall and well covered with snow they came through the winter and matured a considerable portion of their crop. The spring of 1911 was abnormally late in starting, but spring-sown grains are reported as having done well. Winter rye and winter wheat were badly injured by severe freezing in the early winter before snow covered the ground. A number of successful crosses of varieties of barley have been made, and in the first generation some appear to have desirable qualities, but they will have to be grown longer to fix the varieties and determine their worth. As a result of 10 years' work at this station it appears that grain growing is practicable in the interior of Alaska, and that it can be made a success in many parts of the broad interior valleys. An attempt is being made to introduce some of the Siberian alfalfas brought to this country by Prof. N. E. Hansen, of the South Dakota Experiment Station, and there is reason to believe that some of them will become established.

An experiment with potatoes was carried on at Sitka and Rampart with practically the same results at each station. The tubers of a number of varieties were placed in greenhouse flats and allowed to sprout in the light for four weeks before planting. These yielded in nearly every instance an increase of 10 per cent or more in the total crop, with a proportionate increase in marketable tubers.

The Fairbanks Station was largely established to determine the practicability of farming on a considerable scale. With this in view, grain and potatoes were grown on a commercial scale, over \$1,500 worth of potatoes being sold from the station farm. Some of the potatoes were destroyed by early frost, but from 3¼ acres 410 bushels of potatoes were harvested. A considerable amount of grain and hay was produced, and a self-binding reaper, perhaps the first in Alaska, was added to the equipment. The principal energies were expended in extending the area of cultivable land by clearing the dense growth of spruce and birch, about 4 acres being prepared for the plow, with 40 acres additional cleared for pasture and mowing.

Satisfactory progress is reported from the Kodiak Station, where there are now 82 head of pure-bred Galloway cattle of all ages, 10 grade cattle, and 89 sheep and lambs. The stock was successfully wintered on native forage, supplemented by a small amount of purchased grain feed, and there does not appear to be any reason why stock raising should not be made a success in the coast region of Alaska if care is exercised in selecting the stock and they are sufficiently well housed and winter fed. Arrangements are being made to take up dairying as a part of the work at Kodiak, and an attempt will be made to select out the best milkers of the Galloway herd and purchase others to carry on this work.

Some additions have been made to the equipment of the stations, the most important of which are a stock and hay barn and an additional 100-ton silo at the stock farm on Calsinsky Bay and a silo and dairy barn at Kodiak; a barn, a well, and a frost-proof cellar at Fairbanks; and a barn and implement shed at Rampart.

A survey has been made of the tract of land occupied by the station on Calsinsky Bay, and its reservation for station purposes will be asked for.

HAWAII STATION.

Several changes in the personnel of the station have taken place during the year. Mr. F. G. Krauss, for five years agronomist of the station, resigned, and Mr. C. K. McClelland, formerly with the Office of Farm Management of this department, was appointed in his place. Mr. W. T. McGeorge was appointed assistant chemist on certification from the Civil Service Commission. Miss Alice R. Thompson, assistant chemist, was away from the station on furlough and spent the year in advanced study at Columbia University and elsewhere. Mr. D. T. Fullaway, entomologist of the station, was temporarily transferred to the Guam Station late in the fiscal year.

The new office and library building provided for from Territorial funds has been occupied and the old one has been made over into laboratories.

The investigations outlined in previous reports have been continued and a number of new ones have been begun. The work with cotton continues to attract favorable attention, and it would seem that the profitableness of this new agricultural industry has been demonstrated. The climatic conditions most favorable for cotton in Hawaii are fairly well known. It thrives best and makes the largest yield on low lands and in places protected from strong winds. The plants are grown as perennials, and as small trees bear 600 to 1,000 bolls or even more. The quality of lint is high; recent quotations on samples submitted to buyers were 20 cents per pound for Caravonica, 40 cents per pound for "Sea Island," and 28 cents for "Sunflower," an upland cotton, the staple of which averages $1\frac{3}{4}$ inches in length. Experiments have shown the possibility of controlling the Indian cotton boll worm to a great extent by pruning the trees and promptly burning the cuttings at the end of the picking season.

The Japanese rices imported by the station have been successfully grown and samples submitted to rice consumers have been pronounced equal in quality to the imported Japanese rice. The importance of this introduction is apparent, when it is shown that one-half to 1 cent per pound more is paid for Japanese than for other rice. The experiments with fertilizing rice have shown definitely that the fertilizer should be applied before the rice is planted, and that as a source of nitrogen, ammonium sulphate or an organic fertilizer is better than nitrate of soda. In a similar manner, it has been shown that the fertilization of taro should be the same as for rice, and the thorough drying and aeration of the soil between crops, together with proper fertilizing, was found to prevent taro rot. The results obtained by the station in these experiments with rice and taro have been put in practice by many small planters in their operations.

In continuation of the work with pineapples, it has been shown that the chief difficulties with this crop are due to a lack of drainage, and in certain restricted localities to too much manganese in the soils. It has also been found that pineapples can be profitably grown in Hawaii with less rainfall than has hitherto been thought necessary.

Experiments with broom corn at the station were so successful that this crop is being planted to some extent and a broom factory has been established in Honolulu. The quality of the brush thus far

grown in Hawaii has exceeded any received from the Pacific coast and is about equal to that grown in the Ohio Valley. The crop thus far has not been seriously affected by any pests, and, by ratooning, a second and third crop of shorter brush suitable for small brooms can be secured; thus three crops can be produced in one year from a single seeding.

The investigations with tropical fruits have been continued. During the past season a budding method for use on avocados has been perfected to a degree that has given successful unions in 85 to 90 per cent of the cases on young trees, and from 50 to 75 per cent on old trees where top-working is required. Spraying experiments have shown that the rusty blight of avocado leaves can be controlled with Bordeaux mixture. Investigations with the papaya have shown the possibility of orchard production through planting of pistillate plants, without the intervention of male trees, the fruit of which is almost worthless, when any is borne. A wide interest in banana culture has been aroused and the station is assisting it in the distribution of suckers of the Bluefields banana and in cultural experiments. From some of the latter it seems probable that a wider spacing in planting is to be recommended, as the plants when given plenty of room are more robust and withstand winds better.

A number of miscellaneous investigations are in progress. These include varieties and cultural requirements of various forage plants, with special reference to ranch conditions. The results of these experiments are rapidly being put into practice, as is shown by the largely increased production of feed and forage materials. The possibility of weed destruction with arsenite of soda used as a spray solution has been thoroughly demonstrated, and during the past year about 2,000 acres of land were rid of shrubby and herbaceous weeds. The station has in progress experiments on the economic production of oil from kukui nuts, the possible utilization of the pulp from sisal mills, the fiber in banana stalks and pineapple leaves, etc.

During the year a number of bulletins describing some phases of the station's work were issued in the Hawaiian and Portuguese languages for the benefit of those not able to understand readily the English tongue.

During the past year, under Territorial funds, the station has established three demonstration farms, one on Kauai and two on Hawaii. By means of these farms the station will be better able to bring the results of its work to the farmers and at the same time conduct experiments with different crops under varying climatic conditions. Two similar farms on Maui are to be established soon.

PORTO RICO STATION.

The Porto Rico Station has made substantial progress during the year. The new building has been completed and occupied and the general condition of the station greatly improved. The lawsuit involving the title of the station farm has been decided in favor of the station. A few changes have been made in the personnel of the station. Mr. W. C. Taylor, assistant chemist, resigned, and he has been succeeded by Mr. C. W. Ageton, formerly with the agricultural experiment station of the State of Washington. Mr. W. V. Tower, entomologist of the station for five years, resigned at the close of the

fiscal year to accept a position with the Insular Board of Agriculture. Mr. J. W. van Leenhoff, for 10 years in charge of the work at the coffee substation, La Carmelita, resigned, and the work at that place has been terminated.

The relations of the station with the people of Porto Rico are most satisfactory, if the increased correspondence, station visitors, etc., are any criterion. During the past year a number of planters spent several weeks at the station studying improved methods of agricultural practice.

In accordance with the provision in the law, during the year coffee investigations were made a more extensive part of the station work. The lease on the land under experiment on the coffee estate, La Carmelita, was about to expire, and it has been canceled and the work moved nearer the station, where a 95-acre coffee plantation has been placed at the disposal of the station for experiments in renovating an old plantation, studies on coffee diseases, insect pests, coffee improvement, etc. The introduction of the higher-priced coffees into Porto Rican culture has been continued, and some of the Java varieties are coming into bearing. Some 3-year-old trees have borne at the rate of 800 pounds merchantable coffee per acre, while the average of the island is only about 200 pounds per acre. Experiments are in progress on the most effective and economical means of improving the productivity of coffee plantations, studies on a root disease, a leaf-spot disease, a spotting of the fruit, etc. A trial of various adhesives to be added to Bordeaux mixture to prevent its being washed off the foliage by the torrential rains is in progress.

A number of coffee diseases of minor importance are being investigated, as are some of the fungus and other troubles of cacao, coconuts, and bananas. The diseases of citrus fruits have been taken up for study, especial attention at this time being given to gummosis. It is expected that cooperative work on orange scab and end rot of the fruit will also be begun soon.

The horticultural work has been considerably extended, extensive experiments being in progress on stocks, fertilizers, and cover crops for citrus fruits. Special attention is being given to the introduction and propagation of the better varieties of mangoes, more than 40 varieties having been introduced from various tropical countries. Of these, 12 fruited this year, and the station should soon be in a position to tell which varieties are best suited to Porto Rican conditions. The pineapple industry is developing rapidly, and since the bulletin on pineapples was issued in 1909 the question of shade and leguminous cover crops has been given definite consideration. Work is under way on the improvement of those crops of the island that are known to the mass of the people. These include yams, yautias, sweet potatoes, pigeon peas, beans, etc. Some attention is being given to ornamental trees and shrubs, and hardwood and nut-bearing trees. Thousands of trees have been distributed through schools and planters, and the work seems to be rapidly gaining in appreciation.

The work in animal husbandry has been considerably broadened, and it now includes horse breeding to improve the size and conformation of the horse, breeding for work oxen, breeding of dairy cattle, as well as the introduction and breeding of hogs, sheep, and poultry. The surplus stock is sold to planters, and the demand is always in excess of the supply. The investigations on the mineral

nutrition of pigs, begun last year, have been concluded, and the results indicate that calcium chlorid can profitably be used with rations deficient in lime.

Some preliminary investigations in the production of forage crops have been begun and a variety of sorghum introduced from Barbados has given heavy yields on dry, hilly lands. The work in making and feeding silage has been continued, and it appears that the production of good silage offers fewer obstacles than in a temperate climate.

The study of the cause of chlorosis in pineapples has been concluded and the results have been presented for publication. It was found that the condition for chlorosis was too much carbonate of lime in the soil. Two or more per cent of calcium carbonate in soils was found detrimental to pineapple growing, and a survey of soils is recommended before planting to this crop. The effect of strongly calcareous soils, as well as those deficient in lime, in causing physiological derangements of plants is receiving attention. Investigations on the lime and magnesium ratio for the proper nutrition of plants and animals are in progress, the studies being made with rice and pigs. Further work is being done on the disinfection of Porto Rican soils which have become unproductive through the presence of various organisms, but a greater range of experiments are necessary before definite conclusions can be drawn.

During the past year an association of the sugar planters of the island established an experiment station, placing a tonnage tax on their product for its maintenance. This station will study the peculiar problems relative to the production and manufacture of sugar and the Federal station will be relieved of much work it had been impelled to carry on with this crop. Some cane breeding and a few cooperative experiments that were begun some years ago will be concluded, but otherwise investigations on this crop will be discontinued.

The efforts of the station to secure diversification are meeting with success, and intensive farming is assuming its proper place in the agriculture of Porto Rico.

GUAM STATION.

Much work has been done at the Guam Station in the construction of new buildings, building roads, clearing and draining lands, etc. The new office building was completed and occupied in the fall of 1910, and the use of the rented quarters was discontinued. A storehouse in which to keep the farm implements was completed during the year, as was a stock barn 30 by 40 feet in extent. This gives ample space for 12 head of stock, with the necessary feed and storage room for a large amount of hay or other forage. The road system has been extended by the construction of about 1,000 feet of cascajo road, and walks have been made about the new office building. A lawn of Bermuda grass has been established, and ornamental and hedge plants set out. These are kept clean and in order as examples of neatness and cleanliness, which are generally lacking about the native home. Upon the occupancy of the new quarters it was possible to inaugurate a system of records that a lack of suitable office space made impossible. Considerable additions were made to the office equipment, and the beginning has been made of a station library.

The field operations with all crops were more successful than during the previous year, due probably to the improved condition of the soil which followed a year's proper cultivation. The leading investigation continues to be the production of feed and forage preliminary to experiments on the improvement of the live stock of the island, and includes experiments with corn, various grasses, and leguminous forage plants.

The experiments with corn during the year were to test the Mexican June corn from Manila in comparison with the native corn. The yield of the Mexican June corn was heavier, the ears were filled better, and the grain deeper and less flinty than the native varieties, but in an experiment on keeping seed corn under identical conditions the samples of Mexican June lost all ability to germinate, while a perfect stand of native corn was obtained. These experiments are to be continued and extended so as to include varieties of corn from practically all tropical countries.

The experiments with the grasses have shown the superior value of Para grass followed by *Paspalum dilatatum* and Guinea grass over all others tried. The Para grass, which was introduced through the Hawaii Experiment Station, has multiplied until the station now has an acre planted, which is to be extended, and has distributed a large number of clumps of roots for planting.

The production of forage from several of the nonsaccharine sorghums has been fully demonstrated. Of the leguminous plants under observation the pigeon pea, jack bean, and common peanut have given promise of success.

Much work has been carried on with vegetables. For some, additional data regarding the proper planting season must be secured. Beets planted in March have done well. Patolas (*Luffa aegyptica*), a vegetable usually cooked with meat or in soup, has been introduced from Manila and has proved very satisfactory. This vegetable was formerly grown in Guam, but the stock had apparently been exhausted. Limited quantities of seed of this vegetable have been distributed during the year. Radishes, especially a variety grown by the Chinese gardeners about Manila, have given excellent results. Carrots were tested and gave full satisfaction. Onion seed planted in December failed to germinate. Where sets were received from the United States and planted, fairly good bulbs were produced. Watermelons have given excellent results, but muskmelons failed to ripen well and were lacking in flavor. Cucumbers, lettuce, and eggplants gave good yields of excellent quality. Less success has been attained with cabbage and tomatoes, but further trials are in progress.

One of the most striking achievements is in the introduction of the Smooth Cayenne pineapple from Hawaii. The plants have fruited, are of excellent quality, and many fruits weighed as much as 10 pounds, as compared with a maximum weight of 4 pounds for the native fruit. There is much interest in this fruit, and the station will distribute 1,000 or more plants this year. A number of other varieties of pineapples have been introduced for trial at the station. The results with avocados, oranges, lemons, and pomelos have been satisfactory, the trees making good growth, but all are too young to bear fruit. An attempt is being made to introduce Japanese persim-

mons, and trees of 10 varieties have been secured for trial in different parts of the island. Peen-to peaches, several varieties of grapes, strawberries, some Philippine varieties of bananas, and many other fruits have been introduced and are being given a trial.

Miscellaneous plants, such as Ceara rubber, kola nut, camphor, hedge plants, and some ornamentals, are being tested. A Ceara rubber tree attained a height of 16 feet and a circumference of 10 inches, 3 feet from the ground, in a year from the planting of the seed.

Mention has been made in previous reports of the desirability of taking up experiments on the improvement of the live stock of the island. All stock is very much degenerated, owing to various causes. The horses are small and weak, likewise the cattle. A number of head of cattle were slaughtered for beef last year, and animals ranging from 20 months to $2\frac{1}{2}$ years dressed $125\frac{1}{4}$ to 358 pounds. There were purchased for the station 6 head of Morgan horses and 4 of Ayrshire cattle, and had it not been for the placing of the Army transport *Dix* out of commission for the summer they would have been in Guam before the end of the fiscal year. They were started from Seattle in September, and in addition some poultry and 4 head of Berkshire hogs were sent. If this preliminary introduction proves successful, other breeding animals will be introduced into Guam as opportunity offers.

A growing interest in the work of the station is noted and all requests for seeds and plants have been granted as far as supplies were available, and instructions given regarding their planting and care, every encouragement being offered to increase interest and bring success to the planter. The cordial cooperation of the local authorities in furthering the station's work has aided materially in the attempt being made to improve the agricultural condition of the island.

PROPOSED STATION OF TUTUILA.

The attention of the department has been called to the desirability of establishing an agricultural experiment station on the island of Tutuila. This and the adjacent Manua Islands, of the Samoan Group, came into the possession of the United States in 1899. The population of over 5,000 is mainly engaged in agriculture, copra, the dried flesh of the coconut, being about their only marketable product. The naval governor of the islands reports that the coconut beetle has appeared on Upolu, the largest of the Samoan Group, only about 40 miles from Tutuila. Wherever this pest has gained entrance it has proved very destructive, and means should be taken to keep it from gaining admission to Tutuila, or great injury will be done. At the same time it is believed that the establishment of a station would prove of great value to the people through the introduction of new crops, improved methods, better live stock, and more rational handling of their crops. A man educated along the lines of modern agriculture could instruct the natives in the proper methods of planting and be of inestimable value to the people who ceded their islands, containing Pago Pago, the best harbor in the South Pacific Ocean, to this country.

IRRIGATION INVESTIGATIONS.

Dr. Samuel Fortier continues to have charge of the irrigation investigations of this office. The various lines of work outlined in former reports have been continued with such modifications as existing conditions have warranted.

The widespread interest in irrigation, the large sums expended in securing water supplies, the rapid settlement of lands, and the great agricultural development under irrigation enterprises have necessitated the expenditure of much more time and funds in furnishing information to prospective settlers and in extending timely aid to those who are endeavoring to establish homes in the reclaimed portions of the arid lands of the West. The number of inquiries from eastern people for information concerning agricultural conditions in the different sections of the West has increased more than 40 per cent during the year. This demand has been so great that it has been necessary to have reprints of nearly all the bulletins of both the practical and State series described in former reports. During the year three additional bulletins of the State series have been published, leaving but five of the arid and semiarid States that have not been covered.

The thousands of settlers who have settled on irrigated lands during the past three years are for the most part ignorant of irrigation practice and methods, and both the most recent settler and the pioneer irrigator are continually confronted with new problems. To assist both the old and the new settlers, agents have been maintained throughout the entire year in 10 of the Western States, and in 3 others during the spring of 1911. These agents devoted a large part of their time to traveling from place to place in their respective States collecting data, studying conditions, giving practical advice to irrigators, consulting with the officers of irrigation enterprises regarding the improvement of methods, and addressing farmers' meetings upon practical irrigation questions. The work of the agents has been supplemented to a large extent by the bulletins and circulars of this office and the Farmers' Bulletins of the department, three additional bulletins and two circulars having been issued during the past year.

A great amount of data concerning the organization and management of irrigation enterprises has been collected during the year under a cooperative agreement with the Bureau of the Census. These data will enable the series of bulletins on irrigation in the several States and Territories to be brought up to date and will make possible a much needed series of bulletins on the organization, maintenance, and operation of canal systems and other economic phases of irrigation.

The value of water for irrigation purposes is rapidly increasing as the more plentiful and accessible supplies have been appropriated. As the cost of water advances the need of greater economy in its use becomes more and more urgent and consequently one of the most important features of the irrigation investigation work continues to be its efforts to obtain better irrigation laws, more efficient administrative systems; and a higher duty of irrigation water by lining earthen ditches, by more thorough preparation of the land, by more

equable delivery of water from the canals, and by more skillful application of the water to the fields.

The increasing cost of utilizing surface supplies of water has also led to the installation of many pumping plants to use the underground waters. This has created a great demand for information regarding wells, pumps, and kinds of power adapted to irrigation. At least six of the State agents have devoted a considerable portion of their time to this phase of the investigations, and as a result many costly mistakes on the part of the irrigators have been prevented and more efficient plants have been installed.

The demonstration farms described in former reports have been continued at Davis, Cal., Gooding, Idaho, Newcastle and Cheyenne, Wyo., and Eads, Colo., for the purpose of demonstrating proper methods of using water and the possibility of irrigating small tracts in connection with larger areas used for dry farming. The experiments to ascertain the losses of water from irrigated soils under different conditions have also been continued during the year at Agricultural College, N. Mex., Bozeman, Mont., Williston, N. Dak., Sunnyside, Wash., Reno, Nev., and Davis, Cal., the experiments for the fiscal year having been planned to show the effects upon the evaporation of cultivating the soil at different depths.

The demands of rice growers in Arkansas, Louisiana, and Texas for information and advice regarding the methods and the effects of irrigating rice have become very urgent. Two men were added during the year to this field, but the number is still inadequate to solve the many new problems arising from time to time. The interest in irrigation in other sections of the humid regions which have suffered so from drought during the past two years has also greatly increased, and requests for information regarding the methods adapted to eastern conditions and the possibilities and costs of supplementary irrigation have been received almost daily. Cooperative experiments were continued in Wisconsin, Iowa, Alabama, Florida, Georgia, and New Jersey during the year. Only a small amount of data, however, is available as yet, but this points to the conclusion that before many years all high-priced, intensively farmed crops in the humid section will be insured against drought by the means of irrigation.

During the year the office has cooperated with 10 States, either directly or indirectly through their experiment stations, in carrying out irrigation investigations. The total amount expended by the several States and Territories in funds and services under these cooperative agreements has exceeded \$20,000. These cooperative agreements have enabled the field of investigations to be greatly extended, have afforded trained men to oversee experiments, and many results have been obtained which could not have been possible otherwise.

WORK IN THE FISCAL YEAR 1912.

The increased appropriation made by the last Congress for irrigation investigations, together with a number of new cooperative agreements, will make possible many needed improvements and extensions of the work in 1912. The general plan of the work will be the same as in 1911. In States where work has been in progress heretofore, it will be increased and the scope broadened, and as far as possible State agents will be assigned to those States in the irrigated region in

which it has not been possible to have agents heretofore. The investigations in the rice regions and the power and pumping investigations will both be materially increased and publications will be prepared on these subjects.

The investigations for determining the evaporation losses from irrigated soils and the best methods of checking these will be continued, as will also the field experiments, to ascertain the proper time to irrigate, the most economical amounts of water to use, and the best methods of supplying water to different crops in different localities. The several demonstration farms will also be maintained.

It is intended to publish additional bulletins of the series dealing with irrigation in the several States and Territories, and also of the practical series dealing with the irrigation of standard crops.

The investigations in the humid regions will be extended. The present experiments will be continued and enlarged and new investigations will be carried on in other sections of the East. The engineering force in this field will be increased in order to better meet the demands made upon it, and bulletins and circulars will be published giving practical information concerning the methods adapted to humid conditions and the possibilities and advantages of irrigation in the East and Middle West.

It is also planned to make use of the data collected under the cooperative agreement with the Bureau of the Census in preparing bulletins upon the organization of irrigation enterprises, the operation, maintenance, and management of canals, and other economic phases of irrigation.

WORK IN 1913.

The investigations and experiments which are being carried on at the present time, or will be begun in the fiscal year 1912, should not only be continued, but should be extended in 1913. An agent should be established in each western State, together with one or more assistants in the more important ones. The field force in both the humid and rice-growing sections should also be increased. The demand for practical information, both by old and new settlers, is certain to continue and should continue to be supplied through the medium of bulletins, lectures, demonstration farms, and the personal advice of agents. The greatest needs, however, will probably be for experiments and investigations for the purpose of securing a wiser and more economical use of water by preventing unnecessary wastes; of demonstrating the effects upon the yield and quality of crops of irrigation to different depths and at different times; and of securing better organization of irrigation enterprises, better management of canals, and better administration of improved irrigation codes.

DRAINAGE INVESTIGATIONS.

Mr. C. G. Elliott continues to have charge of drainage investigations of this office.

During the past year the unfinished projects of the year previous have been completed and many new projects and investigations taken up. A summary of the work done embraces surveys, working plans and profiles, and reports made for various drainage districts, which may be classed as follows:

DRAINAGE SURVEYS.

I. *Reclamation of lands subject to overflow, as by floods.*—Alabama: Little Hurricane Creek (Tuscaloosa County). Nebraska: Bench lands of upper Elkhorn River (Holt County). Oklahoma: Black Bear Creek (Noble and Pawnee Counties).

II. *Reclamation of lands continually wet—swamps, marshes, etc.*—Arkansas: Crooked Bayou drainage district (Chicot and Desha Counties). Mississippi: Belzoni drainage district (Washington County). North Carolina: Back Swamp and Jacob Swamp (Robeson County). South Carolina: Little Wambaw Swamp (Charleston County).

III. *Improvement of natural watercourses or construction of new channels to provide outlets.*—Georgia: McRae Branch (Telfair County). North Carolina: Third Creek and Fourth Creek (Iredell County). Haw River (Rockingham County). Virginia: Chickahominy River (Hanover and Henrico Counties).

IV. *Farm drainage.*—Arkansas: Penitentiary farm (Lincoln County). Georgia: McRae farm (Telfair County). Maryland: Bureau of Animal Industry farm (Prince George County). Mississippi: Rogers farm (Attala County), Walnut Grove plantation (Coahoma County). North Carolina: Pender County test farm, Edgecombe County test farm, Red Crest test farm (Iredell County). South Carolina: James Island (Charleston County), Clemson College farm (Dorchester County). Virginia: Sterling demonstration farm (Loudoun County), Arlington experiment farm (Fairfax County).

V. *Drainage of irrigated lands.*—Colorado: Grand River Valley, San Luis Valley, Arkansas River Valley. Idaho: Payette and Boise River Valleys, drainage district No. 1 (Lemhi County). New Mexico: Pecos Valley. Texas: Lower Rio Grande Valley. Utah: Various tracts in several counties. Washington: Spokane County, Yakima Valley, including Moxee Valley. Wyoming: Big Horn Basin, including Grey Bull Valley, Shoshone Valley.

PRELIMINARY EXAMINATIONS AND CONSTRUCTION WORK.

In addition to preliminary examinations having been made and reports written for all the projects enumerated under drainage surveys, similar examinations and reports have also been made for the following:

Alabama: Prairie lands. California: Lands injured by alkali in Orange County. Georgia: Effingham County, Telfair County. Maryland: River bottom lands in Montgomery County. Massachusetts: Green Harbor River marsh lands (Plymouth County). Missouri: Wyaconda River (Clark County). North Carolina: Flea Hill drainage district (Cumberland County), Salem Creek (Forsyth County), Beaver Dam Swamp (Harnett County), Brown Marsh (Bladen and Columbus Counties). South Carolina: Sumter, Levy Bay (Hampton County), Wappaoola plantation (Berkeley County), Dean Hall plantation (Berkeley County), Wadmalaw Island (Charleston County), Switzerland (Hampton and Beaufort Counties), Great Pedee River (Darlington County). Virginia:

Drainage district No. 1 (Norfolk County), Newport News, Meherrin River (Greenesville and Southampton Counties).

The following projects for which this office has made surveys and prepared plans are now under construction by landowners:

Arkansas: Black River Levees (Randolph County). Delaware: Redden farm (Sussex County). Georgia: McRae farm (Telfair County). Kentucky: Marrs farm (Henderson County). Maryland: Bureau of Animal Industry farm (Prince George County), Princess Anne Academy farm (Somerset County). Mississippi: Tusculum River (Alcorn County), Walnut Grove plantation (Coahoma County), Rogers farm (Attala County), Bolivar County drainage district. Nebraska: Elkhorn River bench lands (Holt County). North Carolina: Chadbourn drainage district (Columbus County), Pantego drainage district (Beaufort County), Broad Creek drainage district (Beaufort County), Pender County test farm, Lyon Swamp Canal, and Cape Fear River Levee (Pender and Bladen Counties). South Dakota: Vermilion River drainage district (Turner and Clay Counties). Texas: Barstow district (Ward County). Vermont: Morgan horse farm (Addison County). Virginia: Truck experiment station farm (Norfolk County), Berkeley Swamp (Norfolk County).

GENERAL TECHNICAL INVESTIGATIONS.

Further investigations of run-off have been made in Arkansas, Louisiana, Mississippi, Missouri, and Tennessee. These are for the purpose of determining the maximum rate of flood flow to be considered in planning the drainage of wet lands and the protection of areas from overflow by streams; to study the relation of run-off to rainfall, topography, cultivation, character of soil, and size of watershed area; to examine the effectiveness of drainage systems that have been constructed; and to determine proper values for coefficients used in formulas for determining flow in ditches and natural water courses. Some study has also been made of sedimentation in ditches. Other investigations cover studies of the effectiveness of underdrains in the so-called "buckshot" soils; the practicability of constructing ditches by the use of dynamite; the methods practiced in reclaiming tidal marshes in New England, Nova Scotia, and New Brunswick; and the problems peculiar to the drainage of irrigated lands, such as the movement of ground water and the reclamation of areas underlaid by shale at shallow depth. Investigations have been made of the size and operation of pumps for drainage; the construction, location, and arrangement of the pumping plants; and the capacities of the pumps and the plants as affected by the rainfall, the character of the soil, and the interior drainage system.

DISSEMINATION OF INFORMATION.

The assistance given by correspondence from the Washington office, in reply to questions from all parts of the United States regarding the solution of particular problems, is by no means inconsiderable. The engineers also render assistance to individuals and drainage districts by personal consultation regarding proposed plans. The following are examples of this class of the work:

Arkansas: Drainage districts No. 2 and No. 3 (Jefferson County), Fourche drainage district (Pulaski County), Cadron Dam and Levee district, drainage district No. 8 (Clay County). Illinois: Bay Bottoms drainage district (Pulaski County), Cache River drainage district (Pulaski County). Missouri: St. Francis drainage district (Butler County). New York: Swamp lands in the western part of the State. North Carolina: Little Sugar Creek district (Mecklenburg County). Texas: Red River bottoms.

Lectures and addresses were delivered by the chief of drainage investigations and the drainage engineers at the Iowa State College, and at various drainage conventions and meetings of landowners in many States, including Georgia, Idaho, Illinois, Iowa, New Mexico, North Carolina, Texas, Virginia, and Washington.

WORK PLANNED FOR THE FISCAL YEAR ENDING JUNE 30, 1912.

While the staff of engineers has been increased as fast as the appropriation would permit and every effort made to do the greatest good with the money available, the extension of the work has not kept pace with the rapidly increasing interest in the drainage of lands for agriculture. A greater number of preliminary examinations will be made, covering more extensive tracts than many that have been made in previous years, to determine the value of wet and uncultivated areas for producing profitable crops and the practicable methods for draining them. A greater part of the work than heretofore will be assisting the engineers and officials of newly organized drainage districts in securing the best plans for the improvements, by suggestions regarding the securing of engineering data and by advice during the preparation of the plans.

About 20 field engineers will be assigned headquarters in nearly that number of different States and an office established at each place. This will permit a more systematic study of the special conditions of each territory than has been possible in the past. Such problems will be studied as the proper depth and spacing of under-drains in different kinds of soil; the effect of drainage upon the structure of the soils; the fluctuations of stream flow in relation to rainfall, topography, size of watershed, vegetation, and character of soil; also further investigations will be made to determine run-off coefficients, and capacities of natural and artificial water courses. The drainage of irrigated lands injured by seepage water and alkali continues to grow in importance, and the entire time of no less than 7 engineers will be devoted to that work in the arid sections of the West.

WORK PROPOSED FOR THE FISCAL YEAR ENDING JUNE 30, 1913.

The work of the year 1913 will probably be along the same lines as planned for 1912, save that it should be extended to meet the growing interest in drainage. Accurate knowledge of the problems peculiar to each part of the United States can be obtained only by thorough investigation, and for obtaining the scientific data necessary to bring the work of this office to the proper high standard will require continued close study. In the irrigated regions the area needing drainage will continue to increase, and there will be need for

a larger staff of engineers for this work. While the general principles for the drainage of lands injured by seepage water and alkali are fairly simple, the application of them to a particular area is frequently quite difficult. The work of this office is certain to prove of greater value than ever in aiding the development of the agricultural resources of the Western States.

In the humid region interest in the great undeveloped areas, that in their natural state are too wet for cultivation, will continue to increase. As the reclamation of such land is undertaken it becomes imperative that there be correlation between the work of the various districts in each natural drainage unit in order that the improvements may be permanently effective. There should be made careful and comprehensive investigations of the large swamp and overflowed areas. So far as practicable such investigations will be conducted, probably beginning in the lower Mississippi Valley, to determine the value of such lands for agriculture, the natural drainage units, and the general methods of reclamation that will be feasible. The reasonable requests from individuals and associations for assistance in undertaking drainage improvements and prosecuting the work will be complied with so far as possible. The present methods of cooperation have proved very satisfactory and will be continued. The drainage districts usually bear a part of the cost of the field work, sometimes as much as half, while in the construction of experimental drainage systems the office makes the survey and plans, while the landowners furnish the labor and the material.

NUTRITION INVESTIGATIONS.

Dr. C. F. Langworthy continues to have charge of the nutrition investigations of this office.

These investigations, which have to do with the value of agricultural products, both animal and vegetable, used as food, have been continued along a number of lines. Additional studies have been made with the respiration calorimeter of the relative ease of digestion of cheese (American Cheddar) and meat (beef) when used in ordinary amounts as part of a mixed diet, and many tests have been carried on with respect to methods of preparing cheese for the table. On the basis of this and earlier work with cheese, an article on this foodstuff and other possible substitutes for meat was prepared for the Yearbook of the department for 1910, and a Farmers' Bulletin has been written on cheese and its use in the diet, which considers the ways in which cheese may be used in quantity as a palatable, wholesome, and nutritious part of the diet. Material has also been accumulated for use in a technical bulletin on the digestibility and nutritive value of different sorts of cheese. Some of the earlier studies included were carried on in cooperation with the Bureau of Animal Industry and have been summarized in a circular of that bureau.

Numerous improvements have been made in method and equipment in the respiration calorimeter laboratory. Very important accessory apparatus has been installed, which greatly facilitates the heat measurements and gives an automatic and continuous record of the heat output, which insures accuracy as well as economy of operation. The new apparatus includes a device for the automatic control, as it

enters the respiration chamber, of the temperature of the water current which carries out the heat liberated in the chamber and a device for securing automatically a continuous record of the temperature difference of this water current as it enters and leaves the chamber; in other words, the measurements of factors fundamental to the determination of the energy output of the subject are made automatically and continuously with an accuracy which could not be reached hitherto. At the same time the labor of conducting the experiments has been greatly lessened, a matter of much importance in experiments which may continue uninterruptedly for a number of days at a time. Some of the improvements in the respiration calorimeter have been noted in the description of it in its present form, which appeared in the Yearbook of the department for 1910. Others, together with an outline of new lines of work, have been briefly described in a more recent publication.¹

Particularly interesting is the adaptation of the respiration calorimeter to the study of problems of vegetable physiology, and the results obtained in a series of experiments carried on in cooperation with the Bureau of Chemistry on the respiration and energy output of bananas during the active ripening period. Not only have the results provided facts of great value in connection with studies of ripening fruit which the department is carrying on, as well as facts of theoretical interest, but have also shown that the respiration calorimeter offers a new means for studying problems of vegetable physiology, which are of great importance to the producer and shipper of agricultural products, the warehouseman, and those who store products in the home, as well as to the student interested in technical questions.

The work of collecting and editing data on food and nutrition topics has been continued, as has also the preparation of material for publication in the Experiment Station Record and in Experiment Station Work. An increasingly large amount of time is required for providing data on nutrition and related topics requested by housewives, teachers, and other correspondents.

During the fiscal year a technical bulletin, entitled Calcium, Magnesium, and Phosphorus in Food and Nutrition, has been published, as well as a series of 15 colored food and diet charts. A Farmers' Bulletin on The Care of Milk and Its Use in the Home has been issued in cooperation with the Bureau of Animal Industry. A circular on Food Customs and Diet in American Homes has been published, as well as two articles already referred to, which have appeared in the Yearbook of the department, and numerous summaries, which have appeared in annual reports and similar publications. There has also been prepared for publication during the fiscal year a technical bulletin and two popular bulletins. Since the food and diet charts of the department were published there has been much demand for a descriptive bulletin for use in connection with them, and such a bulletin is being prepared and is nearly completed. Much work has also been done in the editing of other bulletins, both popular and technical and preparing them for publication.

During the next fiscal year it is proposed to continue the work with cheese and meat already in hand, in so far as this seems neces-

¹ Experiment Station Record, 24 (1911), No. 7, pp. 601-606.

sary, and to undertake studies with the respiration calorimeter in cooperation with the Bureau of Animal Industry of the nutritive value of table and culinary fats, supplementing this work by special studies of the use of different fats in preparing foods for the table, and of the general use in the diet of this important group of food-stuffs. Plans have also been made for extended studies of the gaseous exchange and energy transformations of fruits and vegetables during the ripening period, this work to be carried on in cooperation with other bureaus of the department. Such work will be greatly facilitated by the use of a small respiration calorimeter specially devised to meet the requirements of this kind of investigation, which is now being constructed. In this apparatus the use of automatic recording and controlling devices has been extended to operations in which it had not hitherto been attempted. This is of particular importance in experiments that will continue for considerable periods.

For the year 1913 plans have been formulated which involve additional cooperative studies with the respiration calorimeter of problems concerned with fruits and vegetables during ripening and storage, and other physiological studies of plant growth, as well as studies of the changes which take place in animal-food products—for instance, butter, eggs, and cured meats during different conditions of storage. It is also proposed to supplement the technical work by studies of problems of household interest and to continue the preparation of popular bulletins and other publications to meet the demands which are made for them.

REPORT OF THE DIRECTOR OF THE OFFICE OF PUBLIC ROADS.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF PUBLIC ROADS,
Washington, D. C., November 14, 1911.

SIR: I have the honor to submit herewith the report of the Office of Public Roads for the fiscal year ended June 30, 1911, and also an outline of the work planned for the current and ensuing years.

Respectfully,

LOGAN WALLER PAGE, *Director.*

HON. JAMES WILSON,
Secretary of Agriculture.

WORK OF THE YEAR.

During the past year the office continued to cooperate with local authorities in the building of object-lesson and experimental roads. The purpose of this work is to demonstrate standard types of road construction, to introduce new methods, to experiment with new materials, and to instruct local road officials in the proper methods of road building. Under this project roads were built in 52 places during the year.

Advice has been given by engineers and experts of the office concerning model systems in 14 counties during the year. This work involved an investigation of the entire road system of the county, the location of its roads, a study of its materials, its systems of construction, maintenance, and administration, and in fact every feature of the work. Upon the completion of the investigation the engineer prepares a detailed report for the local authorities, giving all data of value in connection with the road system of the county, together with recommendations and detailed plans and estimates for future work covering a period of several years.

During the year 183 assignments of engineers have been made for the purpose of giving special advice and instruction concerning specific problems which local authorities were unable to solve.

Laboratory and field investigations have been continued for the purpose of determining the physical and chemical composition of road materials and road binders and preservatives, and for developing and improving the methods of preparing and applying such materials. During the year 685 samples of road materials were received and tested.

In addition to the routine testing of samples of road materials submitted to the laboratories to determine their qualities, much original research work has been done, particularly with concrete containing an admixture of mineral oils. Oil-mixed concrete was discovered

during the fiscal year 1910, and gave such promise of practical value that its properties were thought well worthy of investigation both in the laboratory and in the field. These investigations have demonstrated the great possibilities of this material for use in constructions requiring damp-proofing, such as basement floors and walls, vaults, sewers, tanks, cisterns, septic tanks, silos, etc. Service tests of roads built of oil-mixed concrete are likewise now in progress and good results are reported at the present writing.

The economic investigations started in 1910 to determine the effect of good and bad roads upon the welfare of rural communities have been continued. This work has been carried on in 11 counties in different parts of the country, and it is proposed to continue it until all of the main roads in those counties have been improved under plans already provided for.

Statistical investigations to determine the mileage of roads of various classes and the cost of improving roads were completed and the results will shortly be published in the form of a bulletin.

Numerous lectures and addresses were delivered and many papers were read before road conventions, farmers' organizations, and scientific societies. The growth of this feature of the work is shown by the fact that during the year 723 addresses were delivered by 22 representatives of the office, as compared with 523 in 1910 and 185 in 1909.

A number of engineer students have been given both practical and theoretical instruction in road building during the year. Seven engineer students were appointed, while 12 highway engineers resigned to accept positions in different States.

Road-improvement trains were operated over the Pennsylvania and Southern Railways. These trains carried a lecture car and a car for models illustrating the various types of road construction and maintenance. Each of these trains was accompanied by representatives of this office, who gave lectures and demonstrated the exhibits. The success of this project is shown by the fact that in four months' time 65,000 people heard the lectures and examined the exhibits.

The appropriation for the fiscal year 1911 was \$114,240, a decrease of \$2,200 as compared with the appropriation for the fiscal year 1910. This amount, however, was transferred to the contingent fund of the department to pay certain expenses which, during the fiscal year 1910, were paid by this office. There were on the rolls of the office on June 30, 1910, 91 permanent employees. During the fiscal year 1911, 68 new employees were appointed, and, since there was a loss of 19 by transfer or resignation, the net increase for the fiscal year 1911 was 49. The total number of employees on the rolls on June 30, 1911, was 140. In addition to these, 13 temporary employees were appointed during the fiscal year 1911.

A detailed summary of the work performed under each project is given in this report as follows:

OBJECT-LESSON AND EXPERIMENTAL ROADS.

The object of the work under this project is to give practical instruction to local road builders in regard to standard methods of construction, and to experiment with and demonstrate the use of new

materials and new methods. This office furnishes at Government expense one or more engineers to make the necessary surveys, estimates, and specifications, supervise construction, and give practical instruction, while the local authorities furnish all machinery, materials, and labor. Before undertaking this work in any community the officials having jurisdiction over the road to be improved are required to make application to the office on a form provided for that purpose. During the fiscal year 1911 two roads which had been begun in the fiscal year 1910 were completed. Fifty-two roads were begun and completed, and two were begun by the office, but were completed by local authorities, while two others were unfinished on June 30, 1911, and will be referred to in the next annual report.

Classed according to the materials of construction, these roads were as follows: Three bituminous-macadam; 1 oiled-asphalt-gravel; 1 oiled-gravel-macadam; 1 oiled-gravel; 1 asphalt-slag; 2 oil-mixed concrete; 3 macadam; 7 gravel; 27 sand-clay; 1 earth and sand-clay; 5 earth; and 2 graded, but not finished. The total cost of all the object-lesson roads constructed under the direction of the office during the fiscal year 1911 was \$118,079. This does not include the salaries or the expenses of the experts and engineers furnished by this office, but represents the total outlay by the communities in which the roads were built.

For the purpose of comparison, the following table is given showing the number of square yards of each type of road constructed during the fiscal years 1905, 1906, 1907, 1908, 1909, 1910, and 1911, inclusive:

Object-lesson roads constructed during 1905-1911, inclusive.

Material.	1905	1906	1907	1908	1909	1910	1911
	<i>Sq. yds.</i>	<i>Sq. yds.</i>	<i>Sq. yds.</i>	<i>Sq. yds.</i>	<i>Sq. yds.</i>	<i>Sq. yds.</i>	<i>Sq. yds.</i>
Oil asphalt-gravel.....							900
Asphalt-slag.....							578
Macadam.....	44,944	51,246	76,376	72,587	96,107	50,333	11,330
Gravel.....	8,804	4,197	11,722	4,608	65,793	71,376	59,942
Shell.....	5,877	12,933		14,020	1,630		
Earth.....		12,132	27,042	85,967	319,456	651,109	140,933
Sand-clay.....	19,178	19,443	85,571	42,634	205,032	177,660	218,177
Burnt-clay.....	400			3,392	2,041		
Bituminous-macadam.....						45,832	41,551
Oil-gravel.....						4,819	9,774
Concrete.....						1,004	
Slag.....						4,610	
Brick.....						526	
Oil-mixed concrete.....							1,917
Total.....	79,203	87,951	200,711	223,208	690,059	1,007,569	485,102

This table shows an increase in the amount of sand-clay roads constructed, but a decided decrease in the number of square yards of earth roads. This is accounted for by the fact that during the year fewer applications were received for assistance in the building of earth roads, and this has had the effect of reducing the total number of square yards built during 1911 to about one-half the total constructed during 1910. Earth-road building is the cheapest form of road construction, and a large quantity of work can be accomplished in a short time. The reduction in the total number of square yards built is, therefore, not important.

COMPLETED ROADS.

BITUMINOUS-MACADAM ROADS.

ROCKPORT, ME.—During the interval from August 20, 1910, to October 13, 1910, engineers from this office were in charge of the construction of a portion of a bituminous-macadam road running from Rockland to Rockport. This road is a trunk-line State road built by the Maine State highway department. Its total length is 23,772 feet, and the construction was let by contract for \$35,700, but this price did not include the bituminous binder. The stone was a rather soft limestone. It was crushed and screened at the quarry and hauled directly to the roadside by the local electric railway company. It cost 75 cents per ton. On October 14, 14,500 feet of this road had been graded and about 13,500 feet surfaced with stone. The road had been completely finished for a distance of 12,120 feet. The following data as to the costs of bituminous treatment were obtained: Total amount applied per square yard, 2.21 gallons; cost of applying, 1.25 cents per gallon; rolling, 1.14 cents per square yard; and foreman, 1.53 cents per square yard. The item of applying tar includes the cost of filling the kettle, heating, and pouring. Three varieties of tar products were applied by the penetration method. All were delivered in 50-gallon barrels, heated in kettles, and spread by hand with pouring pots having fan-shaped nozzles. The cost of spreading the stone, including the spreading of the chips on the tar courses, was 20.97 cents per ton. As the contract price for this road was at the rate of \$7.930 per mile, exclusive of bituminous material, the total cost to the community per mile would be obtained by adding the cost of the bituminous material, which, at approximately 21 cents per square yard, would be \$1,970, making the total cost per mile \$9,900, or approximately \$1.20 per square yard, for the 14-foot bituminous-macadam surface. The road, however, was graded 20 feet wide, and the above cost includes all grading and drainage incidental to the work.

WESTMINSTER, MD.—The work at Westminster, Md., consisted in resurfacing 5,650 feet of Main Street with bituminous-macadam. The work began on August 1, 1910, and was completed on October 18, 1910. The stone used included trap, gneiss, and limestone. In preparing the subgrade 2,000 cubic yards of the old surface were excavated, screened, and relaid. The binder was applied by the penetration method, using a refined water-gas tar and an oil-asphalt, both of which were furnished in accordance with specifications drawn by this office. It cost \$27.75 to spike the old surface with a roller, \$136.50 for plowing, \$320.75 for screening, \$341 for hauling the waste material, \$217.25 for hand picking, \$272 for hauling, and \$62.25 for spreading; and 3,190 tons of crushed stone were purchased at a total cost of \$4,478.50. Hauling this stone cost \$626 and spreading \$131.25. For the bituminous work proper the following were the items of cost: 47,300 gallons of bituminous binder, \$3,325.75; heating the material, \$180.25; hauling it, \$94.50; applying it, \$110.50; rolling it, \$34; and spreading the chips, \$78.75.

The total cost of this road to the community was \$11,618.25, which is at the rate of 56.6 cents per square yard, or \$10.558 per mile. These figures were based on a labor cost of \$1.50 per day of 10 hours, teams at \$3 per day, and fuel at \$4 per ton. The work comprised 20,500 square yards.

KNOXVILLE, TENN.—A section of the Rutledge Pike, beginning at the old schoolhouse and running northeast to Lake Street, was selected for this work. The section is 980 feet in length. Work was begun on July 25, 1910, and finished on September 7, 1910.

The old macadam surface was first spiked up with a road roller, equipped with spikes, and brought to a true grade with a road machine and slips. A spike-tooth harrow was used to bring the coarse stone to the surface and work the fine material down. Crushed limestone was then spread over the surface in a 2-inch layer and rolled until firm. For the bituminous wearing surface a harder, close-grained rock, known locally as iron limestone, was used. The bitumen was applied by the penetration method, using a refined coal tar, a refined tar preparation, and an oil-asphalt on three separate sections.

Unskilled labor was used, which was figured at \$1.35 per 10-hour day for the foundation work and \$1.50 per 10-hour day for the bituminous work. Double teams cost \$3.50 per day, and roller and operator \$3 per day. The limestone cost \$1.20 per cubic yard on the siding, and the iron limestone 67.5 cents per

cubic yard at the quarry. The total cost per square yard ran from 53.7 cents for the oil-asphalt experiment to 60 cents for the refined coal-tar experiment.

The total cost to the community for the entire section was \$1,215, which is at the rate of \$6,486 per mile for a 20-foot road.¹

OILED-ASPHALT GRAVEL ROAD.

AMES, IOWA.—The road selected for bituminous construction at Ames, Iowa, was an old gravel road in the grounds of the State agricultural college. The work was begun on September 19, 1910, and finished on October 12, 1910. The road was 300 feet long, with an average width of 27 feet. The old gravel surface was about 6 inches thick. It was prepared for treatment by working with a disk harrow for a depth of 2 inches. Fresh gravel was then applied and spread with a road grader until the road was well shaped, after which it was harrowed with a spring-tooth harrow until the coarse material appeared on the surface. The oil-asphalt was heated in kettles to about 300° C. and applied at the rate of 1½ gallons to the square yard. During the application the bitumen cooled without penetrating satisfactorily, and, consequently, the road was saturated with water from a hose and again worked with a disk harrow, in which the disks had been reversed. By this means the bitumen was worked into the gravel to a considerable extent. After the road had dried out it was rolled with a 10-ton steam roller until smooth. In all, 900 square yards were finished, at a cost of 2.2 cents per square yard for preparing the surface and 15.5 cents for applying the asphalt. The total cost of the work per square yard was 17.8 cents, which amounted to \$160 for the 900 square yards treated.¹

OILED-GRAVEL MACADAM ROAD.

BOISE, IDAHO.—This road is a continuation of Ninth Street, running south from the Boise River to Morris Hill Cemetery. The report covers the residence of the engineer sent from this office from August 6, 1910, to September 8, 1910. The road is 7,262 feet long and 16 feet wide for the first 5,163 feet and 20 feet wide for the remainder of the distance. The subgrade was very dusty and the No. 1 stone was placed directly on this dust for a depth of 6 inches, filled with sand, and rolled with a 12-ton steam roller. The foundation course was river gravel, ranging in diameter from 2½ inches to 1½ inches, and 50 per cent of it had been crushed. A wearing course of crushed gravel, varying in diameter from 1½ inches to one-half inch, was next applied to a depth of 2½ inches loose; this was rolled and remained some time before the oil arrived. In the meantime, therefore, the wearing surface was harrowed before the oil was applied. The data concerning the oil treatment deal with 1,671 feet only, beginning at a point 428 feet from the Boise River Bridge. The oil came from Port Richmond, Cal., and was furnished under specifications from this office; its cost was 2 cents per gallon, but the total expense, including the freight charges, raised this amount to over 11 cents per gallon. The oil was heated in the tank car and run into a distributing wagon of 500 gallons' capacity, fitted with steam pipes. It was spread with a patent distributor at the rate of 1.75 gallons to the square yard. Sand was then spread over the road and the surface was rolled. In all, 3,713 square yards were treated, at a total cost of 28.83 cents per square yard. The labor cost \$2 and teams \$5 per day of eight hours.²

OILED-GRAVEL ROAD.

LAS CRUCES, N. MEX.—This road is the campus driveway at the New Mexico College of Agriculture. The work commenced on August 11, 1910, and was finished on October 15, 1910. The road is 3,410 feet long and is graded for a width of 30 feet. The surrounding country is rolling and the subsoil is sandy. The excavation cost \$90.50 and was done with plow, slip scrapers, and road machines. The foundation course, 16 feet wide, was an adobe clay applied 4 inches deep. Seven hundred cubic yards of this material were used and hauled for a distance of 1,500 feet. The cost per cubic yard of this work was as follows: Loading, 9 cents; hauling, 20 cents; and spreading, 2 cents. After the clay had been spread, the roadbed was thoroughly wet by irrigation, at a

¹ More complete details of this work may be found in Office of Public Roads Circular No. 94.

² Further details of this work are described in Office of Public Roads Circular No. 94.

cost of \$15. As soon as the ground had dried sufficiently, the subgrade was rolled with a 10-ton steam roller. Fairly good gravel was obtained at a pit 3,000 feet from the road, but it was necessary to screen this gravel, since it contained 40 per cent of fine sand and dirt. The screening was done by hand, and cost, with the loading, 45 cents per cubic yard; hauling from the pit amounted to 26 cents per cubic yard; spreading, 5.3 cents per cubic yard; and sprinkling and rolling, 6 cents per square yard. The gravel was applied as follows: A first course, varying in size from 3 inches to one-half inch, was spread to a depth of 7 inches and rolled into place. A second course, varying in size from 1 inch to one-fourth inch, was next applied, and the road was sprinkled and rolled until firm and smooth. Hot asphaltic oil was then applied at the rate of 1 gallon to the square yard, and was followed by a layer of screened gravel, varying in size from 1 inch to one-fourth inch, which was spread uniformly over the entire surface. The road was then rolled with a 10-ton roller and a second application of hot asphaltic oil was made at the rate of one-half gallon per square yard. The surface was now dusted over with carefully selected fine gravel ranging from 1 inch to dust, and the road was then rolled until firm and smooth. This treatment was given for a length of 2,400 feet. The remaining 1,010 feet were finished without the use of asphaltic oil. The cost of the California asphaltic oil treatment was as follows: Seventy-five cents per 42-gallon barrel at the wells and \$1 per barrel for freight. Heating, hauling, and spreading amounted to a total of \$90.80, making a total cost of 8 cents per square yard for the oil treatment. Other cost items of this work were: Shaping the subgrade, \$48; labor on the cross drains, \$3; and repairs, \$13.70.

The total cost of this road to the community was \$2,411.30. From this may be derived the following unit costs: Oiled-gravel section, 42.1 cents per square yard, or \$3.963 per mile; and water-bound gravel section, 34.1 cents per square yard, or \$3.209 per mile. These costs were based on a labor charge of \$1.50 for nine hours and \$4 per day for teams. Seven and one-half tons of fuel were used, at a cost of \$6.85 per ton. The work comprised 4,266 square yards in the oiled-gravel section and 1,795 square yards in the water-bound gravel section.

ASPHALT-SLAG ROAD.

ROBINSON STATION, ALA.—The section improved here was a portion of the Telegraph Road running north from Mobile toward Mount Vernon. Work began on February 13, 1911, and was completed on February 21, 1911. Three hundred and twenty-five feet of this road were given a macadam surface 16 feet wide. The surrounding land is rolling and the subsoil was sandy over the entire section.

The material used was an asphalt slag donated by a local asphalt company. The slag contained considerable bitumen and was broken by hand in sizes varying from 3 inches to dust. It was black, exceedingly tough, and possessed a rather weak binding quality, which probably could have been improved by crushing fine and heating. The first course of material, varying in size from 3 inches to three-fourths inch, was spread to a depth of 5½ inches and rolled. A second course 2 inches deep, varying in size from three-fourths inch to dust, was then applied. The road was given a crown of one-half inch to the foot. In this work a 3-ton horse roller was used.

The total cost of the work was \$125.88, which is at the rate of 21.8 cents per square yard, and is equivalent to \$204 per mile. These figures are based on a labor cost of \$1.50 per day, and team with driver at the rate of \$4 per working day of nine hours. The work comprised 578 square yards.

OIL-MIXED CONCRETE ROADS.

WASHINGTON, D. C.—From June 6, 1910, to June 14, 1910, an oil-mixed concrete surface, 356.1 feet in length, was laid on Meridian Place, between Center Street and Fourteenth Street. The street is 19.5 feet wide between gutters and has a subsoil of gravelly red clay. All the grading had been done, and the curbs and gutters were in place when this office assumed charge of the work. A foundation of two courses of broken stone was laid. The first course consisted of broken stone varying in size from 1½ inches to one-half inch, laid 5 inches deep. After this had been rolled with a 12-ton roller, screenings ranging from one-half inch to dust were applied and the surface was finished as in the case of an ordinary macadam road. The wearing surface applied to this

foundation course was $2\frac{1}{2}$ inches of oil-mixed concrete and was put on in seven different sections, which differed principally in the method of mixing and placing the concrete and in the different kinds of cement that were used.

Section No. 7 was surfaced by making a stiff mixture of 1 part of cement and 2 parts of sand, to which was added oil to the amount of 10 per cent by weight of the cement. This mixture was spread $1\frac{1}{4}$ inches thick, and the material was immediately covered with broken stone to a depth of $2\frac{1}{2}$ inches and rolled with a 5-ton tandem roller. Repeated rolling failed to fill the voids completely, and so a thin grouting mortar of the same composition was poured over the surface and "broomed" in. After this a light coat of stone screenings was added. This section was 65.8 feet in length.

Section No. 6 was built with concrete composed of a $1\frac{1}{2}$:2:4 mixture of cement, sand, and broken stone. Oil to the extent of 10 per cent by weight of the cement was mixed with the mortar before the stone was added and the mixture was laid to a depth of $2\frac{1}{2}$ inches and tamped until the mortar flushed to the surface. This section was 24.3 feet in length.

Section No. 5, which was 45 feet in length, was spread with concrete prepared in a "bug" mixer. The cement and sand were mixed dry and, after a proper proportion of broken stone, water, and oil had been added, the whole was mixed and dumped on a board, turned twice by hand, and put in place. The proportions of this mixture were $1\frac{1}{2}$:3:4, with oil to the amount of 10 per cent of the weight of the cement.

The proportions for the concrete on section No. 4 were $1\frac{1}{2}$:1:2:4 of cement, sand, screenings, and broken stone, with an addition of oil to the amount of 15 per cent by weight of the cement. The concrete was placed and tamped as described before. The length of this section was 37 feet.

Section No. 3, 68 feet in length, was identical with section No. 4, except that a different oil product was used.

On section No. 2 the oil was reduced to 10 per cent by weight of the cement. The section was 72.4 feet in length. Otherwise the experiment was identical with section No. 3.

No oil was used on section No. 1, in order to compare it with the other sections. Its length was 39.4 feet.

The road was closed to traffic for seven days after the last section was laid and the entire work was sprinkled with water daily during this period.

The cost per square yard of this road varied from \$1.15+ to \$1.25+. A total of 762.45 square yards was built.¹

NEW YORK, N. Y.—During the months of May and June, 1910, this office, in cooperation with the bureau of engineering and construction of the borough of Richmond, New York City, constructed an oil-mixed concrete road on a part of Innis Street at Elm Park Station, Staten Island. The oil for this work was donated by two oil companies and the cement was furnished by four manufacturers through the American Portland Cement Manufacturers' Association. The borough of Richmond, New York City, furnished labor, sand, and stone, while the Office of Public Roads paid the freight on the oil and cement and furnished supervision of the work. Four sections were constructed, each 32 feet wide between the gutters.

The concrete surface was laid upon an old macadam surface, which was first prepared and brought to the approximate grade. The concrete was spread about 4 inches deep. In mixing the concrete a machine of the old Smith type was used. The sand and cement were first mixed dry and then water was added, so as to form a thin mortar. A bucket of oil was added alternately with a barrow of stone, until all the oil required for the batch had been used, when the remainder of the stone was added. After thorough mixing the concrete was dumped on a board, shoveled into barrows, and wheeled to the road. Each batch contained 1 barrel of cement, 8 cubic feet of sand, and 16 cubic feet of crushed stone, varying in size from $1\frac{1}{2}$ inches to three-fourths inch, together with the proper amount of oil.

On the first section of 163 feet the amount of oil used was 15 per cent by weight of the cement.

The second section, 77 feet in length, was the same as the first, except that a different brand of Portland cement was used.

Section No. 3, which was 100.5 feet long, was the same as No. 1, excepting that a third brand of Portland cement was used and a cut-back petroleum resi-

¹ For additional details, see Office of Public Roads Circular No. 94.

due was added to the concrete to the amount of 18½ per cent by weight of the cement.

In the last section, 103.5 feet long, a fourth brand of Portland cement was used with the same cut-back oil as in the preceding section.

In reviewing this work in January, 1911, the division lines between each day's work were plainly apparent. Moreover, some cracks were visible and several cup-shaped depressions were noticed.

For this work common labor cost \$1.85 per nine-hour day; superintendent and foreman, \$6; double teams, \$4; concrete mixer, \$35 per week; sand, \$1.15 per cubic yard at the mixer; broken stone, \$1.50 per cubic yard; and the cement is figured at \$1.32 per barrel delivered. The costs per square yard were as follows: Section No. 1, 89.33 cents; section No. 2, 85.28 cents; section No. 3, 101.7 cents; and section No. 4, 101.7 cents.¹

MACADAM ROADS.

BEREA, KY.—Chestnut Street, running west from the post office, was graded for 1,180 feet, 30 feet wide, and surfaced with stone. Work was begun on September 24, 1910, and completed on December 20, 1910.

Two thousand seven hundred and seventy-two cubic yards of earth were excavated at a cost of 34.4 cents per cubic yard and the grade was reduced from 5 per cent to 3.8 per cent. Two center drains of 4-inch vitrified tile, 180 and 360 feet in length, respectively, were constructed in order to drain the heavy yellow clay subsoil on which the road was built. The pipes were laid in crushed stone and the ends were turned into the ditches. In breaking up the old roadway, a traction engine with a rooter plow was used in some places. On a portion of the road, covering an extent of 1,686 square yards, the yellow clay subsoil was removed and a sub-base course of field stone, varying in depth from 15 inches to 6 inches, was laid in place. This treatment effectually prevented any further trouble with the subgrade. The macadam was placed in two courses. The first course was 4 inches thick, varying in size from 3 inches to 1 inch, and was compacted under a 15-ton steam roller to a depth of 3 inches. The second course, 4 inches in depth, varied in size from 2 inches to 1 inch, and was rolled until it was 3 inches deep, thus making a total depth of 6 inches of compacted macadam surface with a crown of three-fourths inch to the foot. The widening of the macadam from 14 to 30 feet commenced on November 22, 1910, but no steam roller was available to complete this part of the surfacing properly. The various cost data in this work were as follows: Two thousand and fourteen square yards of finished macadam surface costing, for stone on the siding, 97.6 cents per cubic yard; for hauling, 37.2 cents per cubic yard; for spreading, 13.2 cents per cubic yard; and for sprinkling and rolling, 3.1 cents per square yard. The unrolled surface of the road amounted to 2,097 square yards additional. The binder for this portion was not placed on the road, but 120 cubic yards were left in piles by the side of the road, together with 40 cubic yards of crushed stone for maintenance, which brought the total amount of stone purchased up to 1,195 cubic yards. The average haul for stone, from the car to the road, was one-half mile. The first-course stone was limestone field stone for which the railroad haul was 19 miles. The surfacing stone was dolomite and limestone, hauled 27 miles by rail from the Sparks County quarry. The stone used in the sub-base was field stone and stone from the excavated roadbed. A total of 271.2 cubic yards of field stone was purchased for this purpose, at a cost of 97.9 cents per cubic yard. In all, 4,111 square yards of surfacing were laid at a cost of 91.5 cents per square yard, making the total cost of the road to the community \$3,763.51, which is at the rate of \$16.840 per mile. These costs are based on labor at \$1.25 per day, teams at \$3, and fuel at \$2.40 per ton.

FALLS CITY, NEBR.—The road improved at Falls City was the Barada Road running north toward Barada. Work commenced on November 30, 1910, but was suspended from December 3, 1910, until May 22, 1911, and the road was entirely completed July 5, 1911. The road runs through level country with a waxy gumbo subsoil and is 1,818 feet long. A width of 15 feet was surfaced with limestone on a gravel foundation to a depth varying from 7 to 8 inches when loose and with a compacted thickness varying from 4½ to 6½ inches, and the crown was finished three-fourths inch to the foot. The limestone was

¹ For further details on this work, see Office of Public Roads Circular No. 94.

shipped 75 miles by rail and hauled an average distance of 3 miles to the road. It possessed an excellent binding capacity and a fair wearing quality. The quantities and costs on this work were as follows: Nine hundred and forty-two cubic yards of gravel, \$60.29; excavating the subgrade, \$138.94; 727 tons of No. 2 stone, \$1.70 per ton; 159 tons of No. 3 stone, \$1.20 per ton; 50 tons of No. 1 stone, \$2.30 per ton; 5 tons of No. 3 stone, \$1.80 per ton; spreading, rolling, and sprinkling, \$264.74; and shaping the subgrade, \$94.40.

The total cost of the road to the community was \$2,797.40. This was the contract price of the road, for which the township furnished the rough grading in addition. The rate per square yard of finished surface was 88.6 cents for 3,156 square yards, which makes a cost rate of \$7.796 per mile.

KNOXVILLE, TENN.—The section of water-bound macadam was built at the same time as the bituminous-macadam section described under that title. It extended on Rutledge Pike from the end of the bituminous section to Lake Street and for 746 feet on Lake Street, where the width increased from 20 feet to 25 feet. The total surface was 4,063 square yards, including intersections.

One 24-inch by 32-foot vitrified pipe culvert, one 8-inch by 36-foot cast-iron pipe culvert, and one 10-inch by 32-foot vitrified pipe culvert were installed. The work consisted in spiking up and reshaping the old road, after which a new macadam surface of soft limestone was put on.

Unskilled labor was used at a cost of \$1.35 per 10-hour day; double teams cost \$3.50 per day; and roller and operator \$3 per day. The limestone cost \$1.20 per cubic yard on the siding. The total cost of this work was \$1,464, or 36 cents per square yard, which is at the rate of \$4,224 per mile of 20-foot road.

GRAVEL ROADS.

PELL CITY, ALA.—The work at Pell City, Ala., consisted in grading and surfacing with gravel 2,800 feet of the Coosa Valley Road, about half of which was new location. Work was begun on May 16, 1911, and finished on June 21, 1911.

The finished gravel surface is 12 feet wide, with 5-foot earth shoulders. The road runs through hilly country, but the maximum grade was reduced from 14.4 per cent to 6 per cent; 1,300 cubic yards of material were excavated and graded with plow, slips, and grader. The average haul was 400 feet, and the total cost of grading was \$219.47.

One reinforced-concrete bridge with 20-foot span was built, at a cost of \$137.70. The chert gravel used for surfacing was donated in the pit, and approximately 830 cubic yards were hauled and spread loose to a depth of 8 inches, at a total cost of \$176.55, or 21.2 cents per cubic yard. The average haul was one-half mile. The gravel was dumped on boards, spread by hand in one course, and dressed with the grader. No roller was used, but travel compacted the gravel to about 7 inches.

The costs per cubic yard were: Excavating and grading, 15.3 cents; digging the gravel, 7 cents; hauling the gravel, 11.9 cents; and spreading and dressing it, 2.3 cents. The total cost to the community was \$561.82, or 15.05 cents per square yard, which is at the rate of \$1,084 per mile. Laborers cost, per 10-hour day, \$1; teams, which were owned by the town, with driver, \$2 per day; and foreman, \$2. The work comprised 3,733 square yards.

THREE MILE CREEK, ALA.—A section 700 feet in length of the Telegraph Road, running north from Mobile to Mount Vernon, was surfaced 16 feet wide with sandy gravel hauled 83 miles by rail from Jackson in Clarke County. The work began on February 13, 1911, and was completed on March 14, 1911.

The road is upon an old causeway through swampy land and is underlaid with a fill of various materials, including sand, sawdust, clay, shells, and rubbish. It is entirely level and was finished to a total width of 18 feet.

Two hundred and four cubic yards of gravel were placed on the road and rolled to a crown of one-half inch to the foot. The county furnished a 3-ton roller. The gravel had low binding value, but could be improved by inspection at the pit. The haul from the siding was three-fourths mile. The cost per cubic yard in place was \$1.93. With labor at \$1.50 per 9-hour day and teams at \$4 per day the total cost to the community was \$395.20, which is at the rate of 31.7 cents per square yard, or \$2,979 per mile. The work comprised 1,247 square yards.

FORT COLLINS, COLO.—The road improved at Fort Collins was the College Drive on the grounds of the Colorado Agricultural College. It was 2,330 feet long, graded to a 24-foot width and surfaced 16 feet wide with gravel. The work here began on July 8, 1910, and was finished on August 17, 1910.

The surrounding country is rolling and the soil is a very porous clay loam with clay subsoil. It was necessary to excavate 1,522 cubic yards, which reduced the maximum grade from $5\frac{1}{2}$ per cent to 4.8 per cent, at a cost of 24.8 cents per cubic yard, making a total of \$378.10. Two drains were necessary to carry irrigation ditches: One of 10-inch vitrified pipe, 40 feet long, at 28 cents per linear foot; and one of 12-inch vitrified pipe, 30 feet long, at 34 cents per linear foot, making a total cost for the pipe of \$21.40. The labor in placing the above drains cost \$12.10. The entire subgrade was shaped with a road-grader at a cost of \$28.30. The gravel for surfacing was shipped by rail a distance of 12 miles; 1,000 cubic yards were purchased and cost as follows: At the pit, 5 cents per cubic yard; loading on car, 30 cents per ton; and freight, 50 cents per ton. The total cost of the gravel on the siding was \$1,425.23. In hauling the gravel from the siding the college teams were available part of the time, and 727 tons were hauled in this way at a cost of 16.6 cents per ton. When the harvest time came, it was necessary to let a contract for hauling the remaining gravel at 22 cents per ton, making a total cost of \$339.09 for this work. Spreading, sprinkling, and rolling the gravel cost \$125.05. The rolling was done with a 10-ton steam roller. Grubbing cost \$14.50 and surveying \$6.60, making a total cost to the community of \$2,350.51, which is at the rate of 56.7 cents per square yard, or \$5,266 per mile. The labor cost \$2 per day of 10 hours, teams \$4 and \$4.50 per day, and fuel \$4.50 per ton. The work comprised 4,145 square yards.

KALAMAZOO, MICH.—The road improved at Kalamazoo was a portion of the Richmond Road, running northeast from the township line a distance of 2 miles. The adjacent land varies from level to rolling and the soil from sandy to worn-out gravel. The work started on July 5, 1910, and was completed on August 3, 1910.

The road was graded to a width of 30 feet, while the subgrade was prepared to a width of 15 feet. Only a small amount of excavation was required, and this reduced the maximum grade from 3 to 1 per cent. Gravel of very good quality was obtained from a pit $2\frac{1}{2}$ miles from the road and cost 10 cents per load at the pit. Various other items of cost were as follows: Stripping the pit, 0.1 cent per cubic yard; loading, 3.9 cents per cubic yard; hauling, 65.6 cents per cubic yard; spreading on the road, 0.9 cent per cubic yard; and harrowing, 0.2 cent per square yard. The road was rolled with a horse roller at a total cost of \$22, which is 0.13 cent per square yard. The gravel was deposited in two courses—the first course, $7\frac{1}{2}$ inches deep at the center and 4 inches deep at the edges, was compacted by rolling to 6 inches and 3 inches, respectively; and the second course, 3 inches deep at the center and 2 inches at the edges, compacted by rolling to 2 inches and $1\frac{1}{2}$ inches, respectively. The compacted surface was therefore 8 inches at the center and $4\frac{1}{2}$ inches at the edges. The total amount of gravel used was 3,959 cubic yards.

The work on this road was done by county prisoners at a cost of 40 cents per 10-hour day. Double teams cost \$4 per day, and the total cost of the road to the community was \$3,945.15, which is at the rate of 22.4 cents per square yard, or \$1,972 per mile. The work comprised 17,613 square yards.

STARKVILLE, MISS.—Work was begun at Starkville on August 1, 1910, and was completed on July 19, 1911. The road is an extension of Main Street, running east toward the State College. It was 7,000 feet in length and was graded to a width of 50 feet in the cuts and 45 feet in the fills. A sand-clay surface 28 feet wide was constructed for a distance of 6,840 feet. The necessary excavation amounted to 14,416 cubic yards, which cost \$3,160.76, or 21.9 cents per cubic yard. The maximum grade was reduced from 6 to 4 per cent. Four cross drains were constructed, three of 12-inch tile and one of 24-inch tile. The total cost of this pipe and labor for constructing the drains amounted to \$100.58. A total of 5,577 cubic yards of chert-gravel was purchased, costing on the siding \$6,291.84, or \$1.128 per cubic yard. This material was shipped 305 miles by rail and was hauled an average of 3,000 feet to the road, at a cost of 27.3 cents per cubic yard, making a total of \$1,521.57. The spreading cost 4.3 cents per cubic yard, and sprinkling and rolling \$514.29 for the entire work. The material was deposited in three courses, each course rolled by a 10-ton steam roller, and the total finished depth was 7 inches. The gravel was somewhat unsatisfactory.

owing to the presence of clay and foreign matter and its lack of uniformity in size. Additional items of expense on this work were as follows: Damages, \$100; lumber and labor in building a fence, \$37.27; moving graves, \$10.75; and livery bill, \$104.48. The total cost of the road was \$12,288.91, which is at the rate of 67.4 cents per square yard, or \$9.486 per mile. These figures are based on labor costing \$1 and \$1.25 per 10-hour day and teams at the rate of \$3 and \$3.50 per day. The work comprised 18,240 square yards of finished surface.

ARLINGTON, TEX.—A portion of the Arlington-Webb Road, running east from Center Street toward the Cedar Hill Road, 6,928 feet long, was graded and surfaced with gravel. The work was commenced on February 21, 1910, with the culverts, and the surfacing was completed on August 6, 1910. The road runs through rolling land with a black, waxy prairie subsoil. The local authorities furnished the following machinery: One single-team grader, one three-team grader, one 5-ton horse roller, one turning plow, one road plow, one railroad contractor's plow, and one homemade watering tank with sprinkling attachment. The excavating amounted to 6,407 cubic yards and cost \$2,442.18, of which \$29.30 is chargeable to culvert excavation, \$77.40 to bridge excavation, and \$517.90 to ditching. The grade was reduced 0.3 per cent in a maximum grade of 4 per cent, and the road was graded 28 feet wide in the cuts and 20 feet wide in the fills. Three reinforced-concrete culverts and one reinforced-concrete bridge of 16-foot span were necessary. Details of the culvert work were as follows: Culvert No. 1, 2 feet 6 inches by 3 feet by 21 feet 4 inches; culvert No. 2, 3 feet by 4 feet by 21 feet 4 inches; and culvert No. 3, 3 feet by 3 feet 6 inches by 21 feet 4 inches. One bridge was built with 5½-foot abutments and a span of 21 feet 8 inches. The total cost of the above culverts and bridge, including excavation, material, and labor, was \$1,624.50. One thousand nine hundred and seventy-four cubic yards of gravel were used, which, at 95 cents per cubic yard at the railroad siding, amounted to \$1,894.77. Of this amount 212 cubic yards were used for concrete. Unloading the gravel from the train cost \$536.50; hauling to the road, \$860.25; spreading, \$173.16; and patching, dressing, and sprinkling, \$40.25. The gravel was deposited in three courses, 5 inches, 3 inches, and 8 inches, respectively, when loose, and was compacted by rolling to 4 inches, 2 inches, and 6 inches, respectively, leaving a total finished gravel depth of 12 inches. The cost of rolling the gravel was \$225.22. The crown was made 1 inch to the foot, and the width surfaced was 14 feet for 3,400 feet and 12 feet for 3,528 feet, with shoulders making a 20-foot roadway. Additional items of expense on this road were as follows: Rolling the subgrade, \$18.27; engineer's helper, \$11.25; livery bill, \$254.50; and miscellaneous supplies, tools, etc., \$30.35.

The total cost of this road to the community was \$8,233.95, which is at the rate of \$6,175.46 per mile, or \$2.4 cents per square yard, including the cost of reinforced-concrete culverts and bridges. These figures were based on a labor cost of \$1.50 for a 10-hour day, and foreman, with team, \$3 per day. The work comprised 9,993 square yards.

CENTER, TEX.—A gravel road, 1,000 feet long and 15 feet wide, was built on the Shelbyville Road, running east from Center toward Shelbyville. The work commenced on July 8, 1910, and was finished on September 10, 1910. The surrounding country is rolling and the subsoil is alternately sand and clay. The grading was 36 feet wide throughout and required the excavation of 229 cubic yards at a cost of 20 cents per cubic yard, reducing the maximum grade from 4 per cent to 3. The work was done with two farm plows and four No. 2 slip scrapers. The road was shaped with a road machine, and 4-foot clay shoulders, averaging 6 inches deep, were constructed on either side to hold the gravel. Shaping the subgrade cost \$16.10 and building the clay shoulders, \$32.48. The gravel for this work was hauled by rail 145 miles and cost, on the siding, \$1 per ton. A total of 398 yards was delivered, one half of which was unloaded by shovels over the side of the cars at a cost of 8 cents per ton and the other half was dumped from side-dump cars at a cost of 1 cent per ton. One hundred and ninety-eight tons of the gravel were screened by hand, through dash screens, yielding 50 per cent of screened material, which cost 25 cents per ton. Loading this into the wagons cost 3 cents per ton. The average haul to the road for the gravel was 800 feet, and the cost was 17½ cents per ton. The gravel was deposited in two layers. The first course of unscreened material was 6 inches thick and was compacted by traffic. Four inches of the screened material, averaging in size from 1½ inches to one-fourth inch, were then added, and the road was given a crown of three-fourths inch to the foot. The cost of

spreading the gravel by hand was 3.6 cents per ton. Other cost items of this road were as follows: General expenses, \$10, and foreman, \$65.55.

The total cost of the road to the community was \$642.85, which is at the rate of 32.6 cents per square yard, or \$3,375 per mile. This is based on a labor cost of \$1.50 per 10-hour day and teams at \$3.50 per day. The work comprised 1,667 square yards.

SAND-CLAY ROADS.

MOBILE, ALA.—The work here consisted in grading and building a sand-clay surface on the Lott Road, running northwest from Mobile toward Georgetown. The surrounding country is hilly. The construction commenced on March 15, 1911, and was completed on April 1, 1911.

The grade was reduced from a maximum of 6 per cent to 4. Two thousand four hundred and fifty feet were graded to a width of 28 feet in the cuts and 20 feet in the fills. The work required 360 cubic yards of excavation, which cost, with an average haul of 200 feet, 38.8 cents per cubic yard, or a total of \$139.84. Four pipe culverts were built at a total cost of \$70.56.

The surface material was a heavy, sandy clay, and was applied 16 feet wide, with 1-foot shoulders, and 6 inches deep, with a crown of one-half inch to the foot. A split-log drag was the only machine used in finishing the road. The clay was hauled approximately a quarter of a mile. It had low binding value, but good wearing qualities. The cost of hauling, including loading, was 43.3 cents per cubic yard, and the cost of spreading, 5.9 cents per cubic yard, making a total of \$349.11 for placing 708.5 cubic yards. The cost of shaping the subgrade was \$32, which was 0.7 cent per square yard for the portion which required shaping. For a distance of 550 feet no treatment was required, except patching the depressions. The surface was hard, sandy soil. The total length surfaced was 3,000 feet. The total cost to the community was \$593.01, which is 11.1 cents per square yard, or \$1,042 per mile. Labor for a 9-hour day cost \$1.50, and teams with a driver, \$4. The work comprised 5,342 square yards.

VERNON, FLA.—Work was begun on August 4, 1910, on the sand-clay road running northeast from Vernon toward Chipley and was finished on September 2, 1910. The road runs through rolling country with a sandy top soil underlaid with clay. One mile of road was graded to a width of 30 feet, and the first 1,700 feet surfaced 30 feet wide, while the remainder of the road was surfaced to a width of 16 feet.

The earth excavation was done with plow and picks and handled with drag and wheel-scrapers. Twenty-four hundred cubic yards were excavated, with an average haul of 200 feet, at a total cost of \$362.15, or 15 cents per cubic yard. The grade was reduced from a maximum of 6 per cent to 2½. Deep fills were made in layers about 1 foot in thickness, which tended to avoid the settling incidental to the use of scrapers. One 4-horse grader borrowed from the town of Chipley was also available for the work. Shaping the subgrade was partly included in the cost of excavation, but in addition \$43.12 was expended. Three cypress culverts were built, two of which were log culverts 35 feet long and cost \$34.50. The third culvert was a box culvert 10 inches by 24 inches by 35 feet, in which 200 feet b. m. of sawed cypress were used with a total cost of \$7. Eight hundred and fifty-six cubic yards of clay were applied to a depth of 6 inches and were mixed with the sandy subgrade and compacted by the traffic to a depth of 4 inches. The road was shaped with a crown varying from 1½ inches to 1 inch to the foot.

The total cost of this road to the community was \$860.26, which is at the rate of 7.1 cents per square yard or \$860 per mile. These figures were based on labor at the rate of \$1.50 per 10-hour day, teams without drivers at \$2 per day, and foreman's wages, \$3 per day. The work comprised 12,031 square yards.

CHALYBEATE SPRINGS, GA.—This work consisted in grading and surfacing with sand and clay 2,100 feet of the Manchester Road, which runs through the hilly land west from Chalybeate Springs. Two hundred feet additional were also graded. Construction commenced on July 22, 1910, and was completed on August 19, 1910.

One thousand seven hundred and fifty-two cubic yards of excavation were required, which reduced the grade from 10 to 7.14 per cent. The cost of excavation was 8.8 cents per cubic yard, with an average haul of 350 feet. The subsoil is mostly red and mica clay. The work was done with a plow, six wheel scrapers, and a road machine.

Excellent sand for the surface was obtained at an average haul of seven-eighths of a mile and was put on 16 feet wide. The disk harrow was used to mix the sand with the clay subsoil, and, since from stations 0 to 9 the subsoil clay contained an excess of mica, a more suitable clay from other portions of the work, amounting to 88.8 cubic yards, was used. The sand was placed 7 inches deep and compacted to about 5½ inches. Sand to the amount of 444.4 cubic yards was used, at a cost of 40.5 cents per cubic yard, in place. The total cost for harrowing and dragging was \$8.15. An oak bridge with a 16-foot span cost \$29.58. The road was finished with 3-foot shoulders, and its total cost to the community was \$650.52, or 17.4 cents per square yard, which is at the rate of \$1,561.25 per mile. The work comprised 3,733 square yards. The labor on this work was done by prisoners and cost 50 cents per day of 10 hours. Mule teams cost \$1 per day.

EASTMAN, GA.—The work of grading and surfacing 6,200 feet of a 30-foot roadway was begun here on December 5, 1910, and completed on January 5, 1911. The road was the Rhine Road, running southwest from Eastman. The surrounding country is rolling and the subsoil is alternately sand and clay and was suitable for surfacing. The excavation was done with a loosening plow and small tools, and the hauling was done in flat-bottomed wagons for an average distance of 500 feet. The cost of excavation was 9.3 cents per cubic yard for 5,395 cubic yards. The maximum grade was reduced from 10 to 4 per cent. Seven 30-foot corrugated pipe culverts (either 16, 18, or 24 inches in diameter) were required at a total cost of \$272.94. Spreading the entire surface material cost \$74.79, or 1.4 cents per cubic yard. Two road drags and one road machine were used on the work. The crown was finished three-fourths inch to the foot. The labor was done by prisoners and cost 36 cents per day. Mule teams cost 45 cents per day. These figures include guards, medical attendance, food, and clothes. The total cost to the community was \$848.94, which is at the rate of 4.1 cents per square yard, or \$722.92 per mile. The work comprised 20,706 square yards.

LUMBER CITY, GA.—This is a mile section of the McArthur Road, running northeast from the city, and was started on October 6, 1910, and was finished on November 16, 1910. The road was graded 24 feet wide and surfaced with sand-clay construction to a width of 16 feet. It runs through rolling country and has a sandy subsoil throughout. It is an entirely new location and replaces an old winding trail formerly almost impassable in dry weather, especially for motor traffic, on account of the unusually loose character of the sandy topsoil. The road is very nearly straight. A total of 1,538 cubic yards of excavation was done, for which a road grader was used. The grading cost 11.1 cents per cubic yard, making a total cost of \$171.40. The old grade of 9 per cent was reduced to 4 per cent. A 16-inch corrugated metal culvert, 24 feet long, was built at station 13. The end walls for this culvert were constructed of brick laid in lime mortar and were 8 feet by 3 feet by 1 foot. The culvert, with labor, cost \$25.50, and the end walls, \$6.20. The subgrade was shaped at a cost of 0.8 cent per square yard, making a total of \$73.03. The material used for surfacing was a natural mixture of sand and clay of good grade. Two thousand one hundred and fifteen cubic yards of this material were used and the average haul to the road was 3,000 feet. The surfacing was placed 8 inches thick and compacted to 6 inches. The unit cost of the surfacing material was as follows: Loading at the pit, 14 cents per cubic yard; hauling, 12½ cents per cubic yard; and spreading, 4.8 cents per cubic yard. Incidentals amounted to \$62.29. The total cost of the mile of road to the community was, therefore, \$1,000.90, which is at the rate of 10.6 cents per square yard. An interesting feature of this work was the teams furnished free of cost by the citizens. The labor costs were \$1.25 per 10-hour day for free labor and 60 cents per day for convicts. Prison camp teams cost 75 cents per day. The work comprised 9,387 square yards.

REIDSVILLE, GA.—Work began here on June 1, 1911, and was finished on July 1, 1911. The road is the Claxton Road, running through slightly rolling country northeast from Reidsville. One mile of road underlain with sand and sandy loam was graded 30 feet wide and surfaced 16 feet wide with sand-clay construction, and, with 4-foot shoulders, cost \$449.15. The work was done with a road machine, plow, wagons, and small tools. Two corrugated metal pipe culverts were built, one 18 inches by 22 feet and one 15 inches by 30 feet, at a cost of \$26.70 and \$32.10, respectively. Two thousand and sixty cubic yards of

clay and 810 cubic yards of sand were used, the unit costs of which were as follows: Stripping the clay pits, 6.7 cents per cubic yard; loosening, 1.33 cents; loading, 1.3 cents; hauling to the road, 5.5 cents; spreading, 0.31 cent; loading the sand, 0.9 cent; hauling to the road, 4.3 cents; and spreading, 0.3 cent. Further costs were: Shaping the roadbed, 30 feet wide, \$25.31; harrowing, \$3.64; foreman, \$49.50; guards for prisoners, \$69; and clearing the right of way, \$9.

The total cost of this road to the community was at the rate of 4.75 cents per square yard, or \$449 per mile. These figures are based on a labor cost of 30 cents per 10-hour day for prisoners, \$1.30 for county teams, \$3 for foreman, and \$1.50 for guards. The work comprised 9,387 square yards.

WASHINGTON, GA.—This was the Lexington Road, running northwest toward Lexington. The work began here on May 15, 1911, and was completed on May 23, 1911. The road runs through hilly land and the subsoil is red clay. The road had been graded and cross-drains had been built by the county.

One thousand six hundred and forty cubic yards of topsoil were obtained from adjacent fields located along the road. The material contained some stone which was raked out after dumping and kept in the bottom of the surface course. The surfacing was spread 8 inches thick and compacted by traffic to 6 inches. It was made 15 feet wide with 4½-foot shoulders. The costs on this work were as follows: Surface material, \$37.50; hauling for 1,800 feet, 4.32 cents per cubic yard; loading, 0.83 cent per cubic yard; spreading, 0.26 cent per cubic yard; shaping the subgrade with a road machine, \$5.85; shaping with a drag, \$1.80; foreman's wages, \$21.25; and guards' wages, \$22.50.

The total cost of the road was \$177.55, which is at the rate of 2.3 cents per square yard, or \$204 per mile. Prison labor cost 30 cents per day of 10 hours; teams owned by the county, \$1.20 per day; foreman, \$2.50; and guards, \$1.50 per day. The work comprised 7,607 square yards.

MULLINVILLE, KANS.—Work on the road running north from Mullinville toward Kingsley was started on October 17, 1910, and completed on November 25, 1910. The adjacent land is hilly and the soil sandy. Three thousand six hundred and thirty-five cubic yards of excavation were required, with a maximum cut of 6½ feet and an average haul of 223 feet. The maximum grade was reduced from 11 to 6 per cent, and a total length of 4,460 feet was graded. This excavation cost 11.2 cents per cubic yard. The road was graded 24 feet wide. It was prepared for a distance of 3,640 feet for surfacing 14 feet wide, and on this were placed 1,758 cubic yards of clay hauled from a pit an average distance of 2,340 feet. The cost of hauling this clay was 31.4 cents per cubic yard, and the cost of spreading it, 1.6 cents per cubic yard. The clay was placed on the roadbed 12 inches deep at the center and 10 inches at the sides, and was thoroughly mixed and compacted by traffic to a depth of 10 inches at the center and 8 inches at the sides, with a crown of one-half inch to the foot. The roadway was given 5-foot shoulders, making a total finished width of 24 feet. Other items of expense on this road were: Shaping the subgrade, \$23.20, and stripping the clay pits, \$41.70. The total cost of the road to the community was \$1,045, which is at the rate of 18.4 cents per square yard for the finished surface, or \$1,425.75 per mile. Labor cost \$1.80 for a 9-hour day, and teams, with driver, \$3.60 per day. The work comprised 5,662 square yards.

WICHITA, KANS.—The work here consisted in the improvement of Thirteenth Street, running west from the city for a distance of 2,640 feet. The adjacent land varies from level to a gently rolling surface with a sandy-loam subsoil. The work was begun on September 16, 1910, and was completed on October 10, 1910.

Excavations were made to the extent of 950 cubic yards and the maximum grade was reduced from 4 to 2 per cent. The excavation cost 15.5 cents per cubic yard, with an average haul of 400 feet. The road was graded to a width of 36 feet and a 16-foot subgrade was shaped for surfacing, at a cost of 6 cents per square yard. One 18-inch corrugated metal culvert, 32 feet long, cost \$15.20 complete.

A total of 950 cubic yards of sand and gumbo was hauled for an average of 5,000 and 1,160 feet, respectively. The sand was from the bed of the Big Arkansas River, while the gumbo was obtained from draws adjacent to the work. This material cost as follows: Hauling and spreading, per cubic yard, 36.2 cents; mixing, \$9.25; and rolling with a 1½-ton roller, \$4.50. The cementing power of the gumbo varied. For 250 feet the gumbo was spread 6 inches deep and 4 inches of sand were mixed with it; the remainder of the surfacing was

done with 9 inches of gumbo and from 1 to 2 inches of sand. About 400 feet of the road required no surface treatment. The teaming and rolling compacted the surface material to a thickness of 7 inches.

The machinery used on this work included 2 road graders, 1 drag, 6 drag scrapers, and 8 wheel scrapers. Labor cost \$2 per 8-hour day and teams \$4 and \$4.50. The total cost to the community was \$667.45, which was at the rate of 14.2 cents per square yard or \$1,334.90 per mile. The work comprised 4,693 square yards.

COFFEEVILLE, MISS.—This is a section 1 mile long of the Grenarda Road, running west toward Grenarda. The work was begun on February 3, 1911, and finished on April 13, 1911. The road runs through slightly hilly country and is underlaid with sand and clay. Seven lines of cross drains of 15 and 24 inch vitrified pipe were required. Each pipe culvert was finished with end walls of brick laid in cement mortar. A road machine and 8 drag scrapers were used in the excavation, which amounted to 3,410 cubic yards and cost 20.8 cents per cubic yard. The grade was reduced from 14.2 per cent to 7.8 per cent, and the road was graded 24 feet wide for the first half mile and 22 feet wide for the remainder of the distance. The average length of the haul for the excavation was 200 feet. One hundred and forty-eight cubic yards of sand were hauled at a cost of 42 cents per cubic yard and spread on the road at a cost of 4.7 cents per cubic yard. The sand and clay were mixed with a harrow. The cost of the items entering into the construction of the culverts was as follows: 107½ feet of 15-inch vitrified pipe, \$29.02; 125 linear feet of 24-inch vitrified pipe, \$93.75; labor and hauling, \$22.15; 8,400 brick, \$54.60; 60 sacks of cement, \$30; hauling, \$8.45; and masons and helpers, \$51.70.

The total cost of this road to the community was \$1,289.41, which is at the rate of 13.7 cents per square yard. The labor cost \$1 per day of 10 hours and teams \$2.50 per day. The work comprised 9,387 square yards.

GULFPORT, MISS.—The work was commenced here on October 6, 1910, and was completed on November 12, 1910. The road is the Harrison County race track, one-half mile in length, and was graded and surfaced with sand clay 50 feet wide. The surrounding country is level and swampy. The subsoil presented swamp conditions with heavy vegetable mat, hummocks, and sand. One 12-inch box culvert was built to drain the oval within the track. Earth was excavated to the amount of 4,500 cubic yards at a contract price of 35 cents per cubic yard, making a total of \$1,575. Shaping the subgrade cost \$60.85. The surface was finished with a 0.5 per cent grade. The grading was done with 1 grader, 4 drag scrapers, 3 wheel scrapers, and wagons. It required 1,759 cubic yards of clay, which were obtained at Soucier, 19 miles north of Gulfport. The clay was taken out with a steam shovel and loaded on the cars, and a total of 99 cars were used at a cost, on the siding, of \$891. The charge for the clay was \$4 per car plus \$5 for freight. Hauling from the car to the road cost 49.5 cents per cubic yard, and spreading 24.4 cents per cubic yard, making a total cost of the material, per cubic yard in place, of \$1.25. The track was finished with a drag and rolled with a 7-ton horse roller. Rolling and dressing cost \$117.

The total cost to the community was \$3,560, which is at the rate of 24.3 cents per square yard, or \$7.120 per mile for a 50-foot road, which is equivalent to \$2.278 per mile for a 16-foot road. These costs are based on labor at \$1 per day of 10 hours, and on teams without drivers, at \$3 per day. The work comprised 14,667 square yards.

ELIZABETH CITY, N. C.—The work commenced here on July 5, 1910, and was finished on July 28, 1910. The road improved was the Norfolk Stage Road, running northeast from Elizabeth City toward Norfolk. The adjacent land is generally level, with some bottom land. The subsoil was loamy sand and fine sand with silt. The road improved was 1 mile in length, graded to a width of 30 feet in the cuts and 24 feet in the fills. One steel grader, 1 dump wagon, and four 2-wheel dump carts were furnished by the local authorities. No clay suitable for sand-clay construction could be found in this vicinity, although an extensive search was made, and consequently the material found on the road was used to construct the surface, with the exception of a section 200 feet long, which was spread with heavy silt-bearing sand hauled about three-fourths mile. This treatment was somewhat in the nature of an experiment. Two wooden culverts were built at a cost of \$50.20. The total amount of excavation was 1,208 cubic yards and cost 21.6 cents per cubic yard. The grade was reduced from 3 per cent to a maximum of 1 per cent.

The total cost of the road to the community was \$311.20, which is at the rate of 3.31 cents per square yard for the finished surface, or \$311.20 per mile. Prison labor cost 60 cents per 10-hour day per man, and teams cost \$1 per day. The work comprised 9,400 square yards.

MOREHEAD CITY, N. C.—Work began at Morehead City on June 12, 1911, and was completed on June 25, 1911. The road is the Mansfield Road running west toward Newbern and extends through level country with a very sandy subsoil. A total of 1,200 feet was graded 30 feet wide and surfaced with sand clay 14 feet wide with 8-foot shoulders. The maximum grade was reduced from 1 per cent to 0.5 per cent, and the work was done with a 2-horse road machine, carts, and small tools. The charge for this grading is included in the surfacing of the subgrade, which cost \$36.20. Three hundred and eleven cubic yards of clay were hauled from a pit for an average of two-thirds of a mile, and were spread to a depth of 6 inches. The road was finished with a crown three-fourths inch to the foot. The unit costs of the clay were: Loading, 11 cents per cubic yard; hauling, 19.3 cents; spreading, 2.1 cents; and stripping the clay pit and constructing the approach, \$23.20.

The total cost of the work was \$223.45, which is at the rate of 11.9 cents per square yard, or \$982.08 per mile. The work comprised 1,866 square yards.

WILLIAMSTON, N. C.—This work was begun on April 17, 1911, and was finished on May 24, 1911. The improvement is a section of the Hamilton Road running northwest and lies in a rolling country with a soft, sandy subsoil. A distance of 4,000 feet was graded, 3,000 feet of which were surfaced with sand clay to a width of 16 feet, and finished with 4-foot shoulders. It was necessary to excavate 3,471.2 cubic yards at a cost of 23.1 cents per cubic yard. This work was done with a grader and five drag slips. One reinforced-concrete culvert, 2 feet 2 inches by 2 feet 6 inches by 26 feet, was built at a cost of \$100.31. Brick abutments for a wooden deck culvert cost \$227.56. Two vitrified-clay pipe culverts of 18-inch pipe, 25 feet long, and a 12-inch pipe, 26 feet long, cost \$50.77. The pipe culverts were finished with brick end walls. There were 622 cubic yards of surface material hauled at a cost of 39.4 cents per cubic yard and spread for 1.6 cents per cubic yard; shaping the subgrade cost \$32.75; and the total cost of the road was \$1,468.81, which is 27.5 cents per square yard, or at the rate of \$2,584 per mile. These figures apply both to the 5,333 square yards surfaced and to 1,000 feet of unsurfaced grading. They are based on labor at \$1 per day of 10 hours, and teams, without drivers, at \$2.50 per day.

WILSON, N. C.—Work began at Wilson, N. C., on May 17, 1911, and was completed on June 23, 1911. The road is the Raleigh Road running west through comparatively level country and underlaid with clay. Four thousand three hundred feet were graded to a width of 34 feet in the cuts and 26 feet in the fills, and surfaced with 16 feet of sand-clay mixture and 5-foot shoulders. A 2-horse grader was used for this work. Three tile culverts were required, two 12 inches and one 15 inches in size. These culverts were finished with brick end walls and, in addition, 1 culvert was repaired, lengthened with 6 feet of 15-inch tile, and brick end walls were built; 1,387 cubic yards of earth were excavated, of which 420 cubic yards were hauled an average distance of 310 feet. The excavation cost 15.7 cents per cubic yard or a total of \$218.68. The grade was reduced 0.5 per cent from a maximum of 5 per cent. The surfacing material was obtained from a pit $1\frac{1}{2}$ miles from the road, and cost as follows: Stripping and loading, 13.3 cents per cubic yard; hauling, 49.1 cents per cubic yard; and spreading, 0.8 cent per cubic yard. This material was mixed with a disk harrow to a depth of 8 inches at a cost of \$29.65. Additional items of cost on this road were as follows: Preparing the subgrade, \$8.35; final shaping and incidentals, \$27.56; drainage ditches, \$18.97; end walls for the culverts, \$33.02; culvert pipe, \$97.40; and labor for this, \$3.29.

The total cost of the road to the community was \$1,228.29, which is at the rate of 16 cents per square yard, or \$1,508 per mile. Prison labor cost 60 cents per 10-hour day; 1-horse teams, owned by the county, 60 cents; 2-horse teams, \$4; and 4-horse teams, \$8 per day. The work comprised 7,644 square yards.

CARNEGIE, OKLA.—The road runs north toward Alfalfa, through rolling country for a distance of 9,800 feet, and the subsoil is alternately sand, loam, clay, and mixtures of these in varying proportions. The work was commenced on March 6, 1911, and was completed on April 28, 1911. The entire job was let to a contractor on a unit price basis. The road was graded to a width of 24 feet and

all but 1,000 feet was surfaced 14 feet wide with a sand-clay mixture. Grading amounting to 3,352 cubic yards was done with a road grader, 9 wheel scrapers, and 8 slips. The grade was reduced from 8 per cent to 5 per cent. The average excavation haul was 200 feet, and the cost was 8.8 cents per cubic yard. Five concrete culverts and 1 concrete bridge were constructed. The contract price for the bridge, which was 12 feet by 16 feet, was \$474. Additional unit costs on this work were: Shaping the subgrade, 0.27 cent per square yard; concrete for the culverts, \$682.82; loading 3,156 cubic yards of surfacing material at 3.4 cents per cubic yard, \$112.40; hauling, at 22.1 cents per cubic yard, \$698; spreading, at 3.22 cents per yard, \$104.80; roiling, \$38.25; ditches, \$4.40; miscellaneous items, \$135.55; superintendence, \$273; and repairs and incidentals, \$23.80, making an actual total cost of \$2,407.27, except for the transportation of the contractor's outfit. The contractor was paid \$2,786.61. The 8,800 square yards of surfaced road cost 20.34 cents per square yard, which includes the 1,000 feet graded, but not surfaced. This is at the rate of \$1,912 per mile. The labor cost \$1.60 for an 8-hour day, and teams, \$2.80 per day.

CORDELL, OKLA.—This improvement was on the State Road, running west toward the county line, and was 5,000 feet long, of which 4,500 feet were surfaced 16 feet wide with sand-clay construction. The work began on May 5, 1911, and was completed on May 13, 1911. The road runs through level country and is underlaid with black loam and sand. It was necessary to excavate 500 cubic yards of material at a cost of \$12.10, and shaping the road cost \$9.45. A sand-clay mixture was spread over an extent of 2,666 cubic yards to a depth of 6 inches. Excavating, hauling, and spreading the material cost \$160; and charges for superintendence, guards, warden, sergeant, and the camp amounted to \$246.36.

The total cost of the road was \$466.32, which is 5.8 cents per square yard, or at the rate of \$546 per mile. Eight thousand square yards of finished surface were improved, together with a portion graded, but not surfaced. Prison labor cost 18 cents and teams 85 cents per day of 9 hours.

AIKEN, S. C.—Construction began here on October 18, 1910, and was completed on November 10, 1910. The work consisted in surfacing with a sand-clay mixture a section 5,255 feet long and 30 feet wide on the Montmorency Road running northeast from Aiken city limits. Three hundred and fifteen cubic yards of earth were excavated at a cost of 14 cents per cubic yard, and 1,000 cubic yards of clay were removed from ditches at the sides of the road at a cost of 11.1 cents per cubic yard. This clay material was used for surfacing and cost 0.04 cent per cubic yard to spread. The clay and sand were mixed with a disk harrow and the road was rolled with a 2-ton horse roller. The surface was given a crown of one-half inch to the foot and was compacted to 8 inches in depth. One 10-inch vitrified-pipe culvert, 30 feet long, with 5-foot ends, was built at a cost of \$28.86. The maximum grade was reduced from 10 per cent on the old road to 1 per cent on the new road. The surrounding country is level and the subsoil is mostly sand, intermixed with clay, and worked up with the material from the side ditch into a good surface. The following machinery was available for this work: One road machine, one cutaway disk harrow, one spike-tooth harrow, one hardpan plow, one side-hill plow, one split-log drag, and one 2-ton roller. Among the items of cost on this work were: Back-filling the side ditch, \$40.07; plowing, harrowing, and grading, \$81.42; grading and clearing, \$28.92; and rolling, \$15.98. The total cost to the community was \$391.10, based upon prison labor at 40 cents per day and double teams, with driver, at \$1 per day. This is at the rate of 2.33 cents per square yard, or \$391.10 per mile. The work comprised 16,750 square yards.

ALLENDALE, S. C.—The work commenced here on October 29, 1910, and was completed on November 16, 1910. Three thousand and seventy feet of the Matthews Bluff Road, running southwest from Allendale, were graded and surfaced with a sand-clay mixture to an average width of 22 feet. It was necessary to excavate 350 cubic yards and this reduced the maximum grade from 4 to 1 per cent. The average excavation haul was 1,000 feet, and the cost per cubic yard was 12 cents. The total cost of shaping the subgrade was \$6.50. The road runs through level country and the soil is very sandy. Below the sand is found a layer of clay, which was excavated from the ditches and placed on the road at a cost of \$132.75. Mixing the clay with the sand cost \$35.50, and back-filling the ditches with surface sand cost \$19. The depth of the surfacing was 10 inches, but it was compacted by traffic to 8 inches. The road was given a crown of one-half inch to the foot. The machinery used on this job was 1

road grader, 4 wheel scrapers, 1 cutaway disk harrow, 1 clay plow, 1 turning plow, and 1 spike-tooth harrow. The total cost of this road to the community was \$252.75, which is at the rate of 33.6 cents per square yard, or \$435 per mile. These figures are based on prison labor at 50 cents per day and county teams at 75 cents per day. The work comprised 7,845 square yards.

DARLINGTON, S. C.—The work at Darlington, S. C., was begun on June 27, 1910, and finished on July 9, 1910. It thus falls partly within the preceding fiscal year. The road was the Darlington-Florence Road and was graded to a length of 3,780 feet an average of 25 feet wide. All but the last 100 feet was surfaced 20 feet wide with sand-clay construction, of which 2,945 cubic yards were used. This material was obtained near the road and cost \$127.25. Four pipe culverts were built at a cost of \$52.70. Clearing, grubbing, and grading the road cost \$90.

The total cost of the road to the community was \$269.95, which is at the rate of 3.3 cents per square yard, or \$387 per mile. Prison labor cost 50 cents per 10-hour day and mule teams 75 cents per day. The work comprised 8,178 square yards.

HAMPTON, S. C.—For a distance of 500 feet on the Estelle Road, running south from Hampton, a sand-clay wearing surface was built. The construction commenced on August 13, 1910, and was completed on August 17, 1910. In addition to the sand-clay surfacing, 1,000 feet were graded 30 feet wide. The local authorities furnished a grading machine, two wheel scrapers, and four 2-wheel dump carts. No grading was done, but the road was shaped at a cost of \$20, and 179 cubic yards of sand-clay material, costing 19 cents per cubic yard in place, were used. A force of 23 prisoners, costing 35 cents per day per man for a working day of 12 hours, was used on this road. Teams cost 50 cents per day. The total cost of the road to the community was \$54, which is at the rate of 6.1 cents per square yard, or \$429.10 per mile. This expenditure includes the unsurfaced grading. The work comprised 889 square yards.

KINGSTREE, S. C.—This road is the Johnsonville Road, running east toward Johnsonville. The road is 800 feet long, runs through level country, and is underlaid with sand. The work commenced on April 6, 1911, and was finished on April 13, 1911. No excavating was done, but a sand-clay mixture was applied for a width of 20 feet, with 2½-foot shoulders. Clay to the amount of 345 cubic yards was dug from a pit at a cost of 3½ cents per cubic yard, hauled an average distance of one-half mile for 23.5 cents per cubic yard, and spread for 1.8 cents per cubic yard. Shaping and mixing cost \$6.20, while spreading the sand and dragging the road cost \$5.90. The total cost of the road was, therefore, \$112.10, which is at the rate of 6.3 cents per square yard, or \$739 per mile.

This road was constructed for the purpose of demonstrating the best methods for securing a proper sand-clay mixture by the use of the disk harrow and in order to introduce the use of the split-log drag.

The above figures were based on prison labor at 5 cents per hour, teams at 10 cents per hour, and foreman at 20 cents per hour. The work comprised 1,777 square yards.

KINGSTREE, S. C.—Work on surfacing with a sand-clay mixture 400 feet of the Charleston Road, running north toward Lake City, began here on April 10, 1911, and ended on April 13, 1911. The road was finished to a width of 20 feet, with 2½-foot shoulders, at a cost of \$41.80. The cost was 47 cents per square yard, or at the rate of \$552 per mile. The work comprised 885 square yards. Prison labor on this work cost 45 cents per day of nine hours; foreman, \$1.80; and teams, 90 cents per day.

This section of road was built for the purpose of demonstrating the method of mixing sand and clay by using the disk harrow and also in order to introduce the use of a drag. No excavation was required.

WATERLOO, S. C.—This road is the St. George Road, running northwest toward St. George for 1 mile. The work commenced on September 20, 1910, and was completed on November 25, 1910. The surrounding country is mostly level or slightly rolling. The subsoil was partly sand and partly clay. Three thousand six hundred and fifty-four cubic yards of earth were excavated, and this reduced the grade from 5 per cent to 2.86 per cent. The cost was 6.06 cents per cubic yard, making the total cost \$221.55. The work was done with a road machine, slip scrapers, 5 dump wagons, a steel road drag, and a disk

harrow. Two galvanized-iron pipe culverts were installed, one 18 inches in diameter and 33 feet in length, costing \$43.65, and one 20 inches in diameter, 33 feet long, costing \$48.60. The end walls were made of brick, laid in cement mortar, and cost \$6.70. Shaping the subgrade cost \$69.93. In surfacing this road 1,630 cubic yards of clay, which were obtained from a pit one-half mile distant, were used. The costs of this clay were as follows: Stripping the pit, 13.5 cents per cubic yard; loading, 7.8 cents per cubic yard; hauling, 12.4 cents per cubic yard; and spreading, 1.4 cents per cubic yard. To obtain the sand-clay mixture, sand costing \$17.11 was applied. Harrowing and dragging the road and trimming the shoulders cost \$53.25. The road was graded 30 feet in width and the surfacing material was applied to a width of 20 feet, with a depth of 9 inches, which compacted to 6 inches. Digging an outlet ditch also cost \$6.93.

The cost of this road is based on prison labor at 50 cents per day of 9 hours; guards, \$1; superintendent, \$2.20; and teams, \$1 per day, making a total cost of \$1,206.07 to the community, which is at the rate of 10.28 cents per square yard, or \$1,206 per mile. The work comprised 11,733 square yards.

CENTER, TEX.—An extension 2,300 feet long, from the gravel road running east toward Shelbyville, was built with sand-clay construction, 30 feet wide. Work on this road lasted from July 8, 1910, to September 10, 1910. The road runs through a rolling country with an alternate sand and clay soil. The work required 1,225 cubic yards of earth excavation, which cost, with an average haul of 100 feet, 15 cents per cubic yard, and reduced the maximum grade from 4 to 3 per cent. A road machine was used one day at a cost of \$4.20.

Two corrugated-iron pipe culverts were constructed. For one culvert, two of these pipes, 24 inches by 48 feet, were used, costing \$1 per linear foot; while for the other culvert, pipe 15 inches by 48 feet was used, and cost 60 cents per linear foot. The clay for the sand-clay surface was hauled 1,000 feet. It was loaded with shovels on wagons carrying 1 cubic yard, at a cost of 8.8 cents per cubic yard, while the hauling cost 14.4 cents per cubic yard. At the road, spreading cost 1.4 cents per cubic yard. Over portions of the clay a layer of sand 2 inches thick was applied, at a cost of 7 cents per cubic yard, in place. The compacted surfacing varied from 8 inches to 5 inches in depth and was given a crown of three-fourths of an inch to the foot. The cost of the service of a foreman was \$65.55, while shaping the subgrade amounted to \$4.20.

The total cost of this road to the community was \$798.58, making a cost per square yard of surface, exclusive of culverts, of 8.7 cents, which is at the rate \$1,530 per mile. This is based on labor at the rate of \$1.50 per 10-hour day, teams at \$3.50, and foreman at \$3 per day. The work comprised 7,667 square yards.

LIVINGSTON, TEX.—The work at Livingston, Tex., was begun on October 24, 1910, and completed on November 3, 1910. It consisted in grading a total length of 2,200 feet, 24 feet wide, and in preparing 1,100 feet, 12 feet wide, and surfacing the same with sand-clay construction. As the soil here consisted of sand for the first 11 inches and then clay for the next 11 inches, the required surfacing material was secured near by. One hundred and eighty-four cubic yards of excavation were required, at 20 cents per cubic yard. The maximum cut was 3 feet, and the old maximum grade of 3 per cent was not changed. The average haul for the excavation was 1,000 feet. The work was done with six road plows and four No. 2 slip scrapers, besides the wagons for hauling. The cost of loading the surfacing material was 8.4 cents per cubic yard; hauling, 22.4 cents per cubic yard; and spreading, 2 cents per cubic yard. This material was deposited to a depth varying from 9 to 12 inches and compacted to a depth of from 6 to 9 inches by the traffic. The road was given a crown of three-fourths inch to the foot. A total of 500 cubic yards of surface material was used. One road machine was available for this work, and the total cost of the road to the community was \$227.15. The rate per square yard for the clay surface was 15 cents, and the rate per mile \$1,199. These figures were based on a labor cost of \$1.50 per 10-hour day and \$3.50 for teams. The work comprised 1,467 square yards.

ROCKDALE, TEX.—Work began here on July 25, 1910, and was stopped on August 2, 1910. The road was a sand-clay road, on which \$207 had been expended at the time that work was stopped on account of the scarcity of teams. Two thousand one hundred feet of road were rough-graded and surfaced with clay, with the exception of the final 300 feet. The clay was obtained from a pit with an average haul of one-fourth of a mile. Figuring the clay surface as

18 feet in width, the cost of the road was 5.75 cents per square yard, or at the rate of \$607.20 per mile. The total cost of the road to the community was \$207. The cost of labor on this work was \$1.50 per 10-hour day; foreman, \$3.50 per day; while the teams were furnished free, with drivers, by the neighboring farmers. The work comprised 3,600 square yards.

EARTH AND SAND-CLAY ROAD.

MILFORD, DEL.—Work on the Milford Road, running northwest toward Fred-erica, was begun on July 28, 1910, and completed on August 19, 1910. The road runs through level country and the soil was partly sand and partly clay. The work consisted in grading 6,600 feet, 30 feet wide, and surfacing with sand-clay mixture, 30 feet wide, for 6,600 feet and 12 feet wide for an additional 1,400 feet. The 12-foot surfacing was finished with 9-foot shoulders. The construction thus required the treatment of two sections. The first section was rounded up with a grader machine and traction engine, taking the earth from the ditches. On the second section a sand-clay road was built as follows: Clay was placed upon the old roadbed 8 inches thick and upon this was laid a layer of sand 3 inches thick. After mixing the whole, 4 inches more of sand were added and mixed in by means of a spring-tooth harrow. The sand and clay were obtained from pits and hauled an average of 2 miles by teams at a cost of 46.3 cents per cubic yard. Spreading this material cost 4.2 cents per cubic yard and loading it cost 12 cents per cubic yard. Both sections followed the profile of the old road. The crown of the finished surface was made three-fourths inch to the foot. The total amount of clay and sand hauled from the pits was 486.5 cubic yards. The total amount graded up from the sides was 1,941 cubic yards, and this part of the work cost \$70.63. Other items of cost were: Dragging the entire road, \$12.48; cutting away weeds, \$10.25; excavation other than by grader, \$35.72; incidentals, \$16.20; and labor for surveying, \$22.55. The total cost of the road to the community was \$472.78. The rate per square yard for the first section was 0.46 cent; the same rate for the second section was 19.7 cents, or \$83.54 per mile for the machine-graded section and \$1,389 per mile for the sand-clay road. This cost is based upon labor at \$1.25 for a 10-hour day and teams at \$3 per day. The work comprised 2,200 square yards for the first section and 1,866 square yards for the second.

EARTH ROADS.

MARIANNA, ARK.—Work was commenced at Marianna on October 24, 1910, on 3,500 feet of the Moro Road, running west toward Moro, and was completed on January 18, 1911. Two thousand cubic yards of earth were moved by means of small tools, plows, slips, wagon, and a grader, at a cost of \$581.25. A total of 3,300 feet of this road was finished 30 feet wide and 200 feet were finished with a width of from 20 to 12 feet. The binding quality of the soil was not the best, but the condition of the surface can be maintained by use of a drag and wide tires. Two corrugated-iron pipe culverts were required, the first of two 18-inch corrugated-iron pipes 20 feet long, and the second of two 24-inch corrugated-iron pipes 20 feet long. The total cost of these pipes was \$100; the labor for placing them, \$12.65; and the second culvert was finished with concrete end walls which cost \$31. The county built a bridge over the Caves Hill Branch, which was let for a contract price of \$242. The construction was concrete abutments with steel "I"-beams and 2-inch plank flooring. Other items of expense in this work were as follows: Livery and services of a roadman, \$37; and the Alabama Road drainage ditch, \$168, one-third of which was borne by the county of Lee and two-thirds by the property owners.

The total cost of this road to the community was, therefore, \$1,171.90, which is at the rate of 10.2 cents per square yard or \$1.802 per mile, computed on the basis of a 30-foot width. The labor on this road was done partly by prisoners, but the cost is figured on a basis of \$1 per 8-hour day for the county work and \$1.35 for the city work. The corresponding cost of teams was \$3 and \$3.50 per day. The work comprised 11,444 square yards.

MISSOULA, MONT.—A mile of the Frenchtown Road, running west from the city, was graded and given a crown of 1 inch to the foot. The work was commenced on July 6, 1910, and was finished on July 9, 1910. This work was for the purpose of demonstrating the correct method of obtaining the shape of an earth road running through level prairie land with adjacent rolling country. The road was graded to a width of 30 feet, and 1,175 cubic yards of sandy loam

were excavated. The maximum grade of 8 per cent was about 50 feet in length and was reduced to 4.5 per cent. The work was done with a grader, plows, and slips, with a maximum haul of 200 feet. The cost was 7.4 cents per cubic yard or 0.5 cent per square yard. The total cost was, therefore, \$87 for the mile completed. The work comprised 17,600 square yards.

CENTRAL CITY, NEBR.—A mile of road at Central City, running north toward Fullerton, was begun on August 19, 1910, and completed on September 7, 1910. Three thousand one hundred and eight cubic yards of material were excavated. The local authorities furnished for this work one elevating road grader, one blade grader, two Fresno scrapers, three slip scrapers, one turning plow, one spike-tooth harrow, and one 3-ton concrete roller, besides small tools and dump wagons. The grade was reduced from 6 to 2.5 per cent and the excavation cost 12.34 cents per cubic yard. The graded road was 36 feet wide throughout, with a finished wearing surface of 20 feet. One reinforced concrete box culvert, 2 feet by 2 feet by 24 feet, was built. The items of the concrete work were as follows: Cement, \$16.65; sand, \$5; lumber for forms, \$13.35; broken stone, \$5.25; steel rods and nails, \$6.60; hauling the material, \$5.50; and labor, \$29; making a total of \$81.35. An additional length of 15 feet of 15-inch metal corrugated pipe was placed, at a total cost of \$18.75. The cost of rolling the road was \$30.90, and the finished surface was given a crown of three-fourths inch to the foot.

Based on a labor cost of \$2 a day for nine hours, and teams at \$4 per day, the total cost of this road to the community was \$554.05, which is at the rate of 4.72 cents per square yard, or \$554 per mile, inclusive of culverts. The work comprised 11,733 square yards.

CORDELL, OKLA.—This work was on what is known as the Intercounty State Road, running east, and was 24,000 feet in length. The work was begun on July 16, 1910, and was finished on February 13, 1911. A total of 2,000 cubic yards of rock and 33,803 cubic yards of earth was moved, at an average price per cubic yard of 17.3 cents, making a total cost of \$6,200. The shaping cost 0.8 cent per square yard, which, for 24,000 square yards, made a total cost of \$200.50. The grade was reduced from 15 to 6.6 per cent, and the maximum cut on this work was 15 feet and the maximum fill 20 feet. The following culverts were required: Five concrete arches $2\frac{1}{2}$ by $2\frac{1}{2}$ feet, two concrete arches 4 by $3\frac{1}{2}$ feet, and two concrete twin arches having a total span of 23.5 feet each. It was also necessary to construct one set of concrete abutments 20 feet high by 22 feet long, concrete wing walls 20 feet high by 11 feet long, and two 24-inch corrugated-iron pipe culverts. The culverts required 750 barrels of cement, costing \$2.60 per barrel, or \$1,950. The gravel for the concrete was obtained from the river bed at a cost of 5.98 cents per cubic yard. A total of 483.6 cubic yards of concrete was used. A concrete mixer and road grader were available for the work.

The total cost of the road was \$12,016.20, which is at the rate of 17.31 cents per square yard, or \$2,641 per mile. Prison labor cost 25 cents and county teams 60 cents per nine-hour day. The work comprised 69,333 square yards, or 4.55 miles.

CORDELL, OKLA.—This was a part of the Intercounty State Road running west from Cordell toward Dill. Work was begun on March 3, 1911, and was finished on April 17, 1911. A total of 6,200 feet was graded, requiring 15,355 cubic yards of excavation at a cost of 15.3 cents per cubic yard, or \$2,346.35 in all. Seven hundred and sixty cubic yards of rock also were excavated, at a cost of 51.4 cents per cubic yard, making a total cost of \$390.85. Three pipe culverts were built at a cost of \$206.60. One 4-foot by 4-foot by 26-foot wood culvert and two wooden bridges of 18 feet and 16 feet span, respectively, were also constructed, the culvert at a cost of \$14 and the two bridges at a cost of \$175.25. Other miscellaneous items of expense on this work, including moving the prison camp, etc., amounted to \$271.50.

The total cost of the road to the community was \$3,434.55, which is at the rate of 18.2 cents per square yard, or \$2,910 per mile. Prison labor cost 25 cents, and county teams 60 cents per day of 9 hours. The work comprised 18,890 square yards.

DEMONSTRATION WORK.

MEDFORD, OREG.—This work was done under the auspices of the Crater Lake Highway Commission, representing the Medford Commercial Club. At the request of this Commission an engineer was sent to make a survey of the pro-

posed road and to prepare specifications for the work, which was begun under his supervision. One-half of the funds for surveys and construction was raised by subscription, and the remainder supplied from public revenues by the county commissioners. After the work was well under way, the county commissioners appointed a county road engineer, who took charge of the work. The following report, therefore, includes only the work done under the supervision of this office.

The work was done on a county road leading from Medford, Oreg., to Crater Lake National Park, and extended over what is locally known as Founce rock relocation. By this relocation 100 feet of adverse grade was eliminated and one-half mile of grade ranging from 12 per cent to 33 per cent was replaced by a roadway with a grade varying from 0.5 to 4 per cent, without appreciable increase in the distance.

The country is mountainous and the slopes of the hillsides are steep, ranging in this section from 8 to 35 degrees. All the excavation, with the exception of two short cuts, was open hillside work. This, together with the short haul, reduced the work to what could be done with pick, shovel, and scraper. Push cars were used where economical. The work was done by contract at the following prices: Earth excavation, 18 cents per cubic yard; hardpan, 48 cents per cubic yard; loose rock, 52 cents per cubic yard; solid rock, 98 cents per cubic yard; clearing, \$750; grubbing, \$2,250; and hand-laid riprap, \$1.50 per square yard. All work not covered by these items was done by force account. The free haul limit was 300 feet, and the overhaul was 1 cent per cubic yard for each 100 feet additional. The cost of the work done under the supervision of this office was \$7,512.09, and consisted in the removal of 2,106 cubic yards of earth, 895 cubic yards of hardpan, 2,139 cubic yards of loose rock, and 3,196 cubic yards of solid rock. In addition, a portion of both clearing and grubbing had been completed, 242.2 square yards of riprap laid, and cross drains placed by force account. Labor was paid \$2.50 per day; foreman, \$3.50; and teams, \$30 per month and maintenance. Four thousand five hundred feet of work had been opened up, and 1,600 feet brought to an approximate grade. No surfacing whatever had been done.

The width of the road varied from 18 to 23 feet and all blind curves were widened to insure safety to traffic. Corrugated-iron culverts were used, while head and tail walls were made of hand-laid riprap. The work was done between October 6, 1910, and March 31, 1911, during which 36 days were lost because of rain and inclement weather.

VALLEY CITY, N. DAK.—This was an earth road built along section lines to replace the original cross-country trail. The work consisted in stripping the sod, removing it, and grading and compacting the roadway. The work was done with wheel and slip scrapers and a road grader and was completed with a gasoline traction engine. Approximately 800 feet of roadway had been constructed when the work was turned over to the county authorities for completion.

UNFINISHED ROADS.

On May 18, 1911, the construction of a sand-clay road was begun at Demopolis, Ala. As this work was not completed until July 20, 1911, it will be referred to in the next annual report.

On June 17, 1911, the construction of a bituminous-macadam road at Silver Springs, Md., was started. This work was completed on September 5, 1911. A report on this project will be given in the next annual report.

EXPERIMENTAL WORK AT ITHACA, N. Y.

The experimental work at Ithaca, N. Y., described in the last annual report, had then covered 15 experiments. Since that time the number of experiments has been extended to 24, and the work is still progressing. A detailed account of these 9 additional experiments will be found in Circular No. 94, issued by this office. The experiments were carried out for the purpose of ascertaining the relative value, under practically uniform conditions, of different road binders applied by different methods. The roads selected for these experiments were East Avenue and South Avenue, on the grounds of Cornell University, and adjoined the roads formerly treated. Both of these roads are subjected to heavy traffic during the winter, and in the summer to considerable automobile travel and light draying.

The work was begun on September 12, 1910, and continued until November 10, 1910, when bad weather prevented its completion. It was again taken up on July 10, 1911, and the field work was completed on August 12, 1911, and will be described in detail at a later time. Of the nine experiments mentioned above, one was with refined water-gas tar, one with asphalt block, five with oil asphalt, one with a refined asphaltic preparation, and one with a semisolid refined semiasphaltic oil. In these experiments various methods of applying the bituminous binder were tried, including the penetration and mixing methods and the prepared-filler method. The sections treated were rather short, and most of them did not exceed 300 feet, which made the unit costs rather high. The cost per square yard for the wearing surface varied from 82.18 cents to 49.73 cents. The highest cost was for a section 300 feet in length of oil asphalt, laid by the mixing method, and the lowest cost was for an oil-asphalt section 300 feet long, treated by the penetration method.

INSPECTION OF OBJECT-LESSON ROADS.

During the past fiscal year inspections were made of nine object-lesson roads previously built under the direction of this office. These were located at the following places: Dodge City, Kans.; Palatka, Fla.; Bowling Green, Ky.; Newton, Mass.; Williamston, N. C.; Carnegie, Okla.; Greenville, S. C.; Knoxville, Tenn.; and Mexia, Tex.

All of these roads were found in good condition, some in excellent condition. The road built at Bowling Green, Ky., with rock asphalt presents an especially satisfactory appearance and is significant as a result of construction with locally obtained rock asphalt.

At Greenville, S. C., the contrasting appearance of portions of the same macadam road, built in 1909 and 1910, was striking. The portion finished with bitumen was in excellent shape, whereas the water-bound macadam showed a wear of from 1 to 2 inches.

HIGHWAY BRIDGES AND CULVERTS.

In the report of this office for 1910 mention was made of the need for better highway bridges and culverts. The need still exists and is becoming more apparent each year.

During the year a division of bridge and culvert engineering was established in this office, and an experienced bridge engineer was employed for the purpose of collecting and preparing useful data on this subject and preparing it suitably for distribution. Bulletin No. 39, entitled "Highway Bridges and Culverts," was issued, and other bulletins dealing more in detail with the different types of bridges and culverts, are in preparation.

Upon proper application a bridge engineer will be sent, if deemed practicable, to make inspection, survey, and estimate for proposed bridges and culverts, to prepare plans, and to superintend the erection of such structures. It is intended, however, that this assistance shall be limited to object-lesson work.

Under the direction of the bridge engineer of the office, there were built at Bennettsville, S. C., between November 12, 1910, and December 16, 1910, three reinforced concrete culverts at a cost of \$332.50 for labor alone. Culvert No. 1 was a 16-foot span, 30 feet wide to the outer side of the parapets, with side walls 4 feet high and the cover of the steel I-beam type incased in concrete. Culvert No. 2 was a 7-foot span, 30 feet wide to the outer side of the parapets with side walls 5 feet high and the cover of reinforced concrete slab. Culvert

No. 3 was a 2-foot span, 30 feet wide to the outer side of the parapets, with side walls 2 feet high and the cover a reinforced concrete slab. Screened gravel was used in all the concrete for the aggregate. The following distribution of labor cost is made: Excavation, \$38.50; screening the gravel, \$31.50; hauling the gravel, sand, and cement, \$184.50; mixing the concrete, \$14.50; and building and removing the forms, \$33.50. Convict labor was used on this work and was charged at 50 cents per man per day of eight or nine hours, which was practically the cost of boarding and caring for the convicts. County teams were used and charged at \$1.50 per day per team.

INSTRUCTION IN HIGHWAY ENGINEERING.

The plan of appointing graduates in civil engineering from the leading engineering institutions in the country to the position of engineer student in this office has continued along the same lines as heretofore. An examination was held on March 8 and 9, 1910, under the supervision of the Civil Service Commission, and an eligible register was established from which seven engineer students were appointed during the fiscal year.

The demand for competent highway engineers is increasing throughout the country from year to year. During the fiscal year 1911, 12 highway engineers resigned their positions in this office to accept service in connection with road work in various parts of the country. Of this number 8 were junior highway engineers, 3 were engineer students, and 1 occupied the position of highway engineer.

During the first year that engineer students are connected with the office, they are given a thorough training in all branches of highway work, both in the field and in the laboratories, while at the same time their services are fully utilized by the office in laboratory and field work. At the end of the first year, if the students prove worthy and it is found that the needs of the service justify it, they are promoted to the position of junior highway engineer. At the close of the second year they are eligible for further promotion to the grade of highway engineer, and ultimately to the position of senior highway engineer.

This project has given excellent results, and the engineers after a few years' training in the office are in great demand for State and county work. The practice of permitting these engineers to resign is detrimental in one sense to the service, in that the office is constantly losing some of its best men, but the benefits derived by the various States and counties through the distribution of trained men to all sections of the country are so great as to be a vindication of the wisdom of this project.

PHYSICAL AND CHEMICAL INVESTIGATIONS OF ROAD MATERIALS.

During the fiscal year 1911 there were received by the physical, chemical, and petrographic laboratories a total of 685 samples of road materials to be tested. These included rocks and gravel for road-building, oils, tars, and other dust-preventives and road-preservatives, sand, clay, brick, slag, cement, coke, concrete, and concrete waterproofing materials.

PHYSICAL TESTS.

The rocks tested included 42 samples of trap rock, 74 of limestone and dolomite, 22 of sandstone, 11 of granite, 35 of gneiss, schist, shale, and slate, 18 of slag, 31 of sand, clay, and gravel, and 1,907 miscellaneous samples of a great variety of road-building materials, exclusive of oils, tars, and other dust-preventives and road-preservatives. These were received from a widely distributed area, including 42 States and Territories, Porto Rico, Canada, and Germany. The States sending the greatest number of samples were Pennsylvania, 42; Virginia, 41; New York, 22; Illinois, 14; Ohio, 14; and Maryland, 12. Laboratory investigations of slag for road-building have been continued and information has been collected regarding cement-slag mixtures and concretes.

As in the past, instruction has been given in the testing laboratory to student engineers and assistant highway engineers who have become recently connected with the office. From this laboratory course of instruction, the field engineer receives knowledge which enables him to cooperate more intelligently with the laboratory in road material investigations, in addition to gaining a more intimate acquaintance with the physical qualities of the materials which he uses in construction.

More equipment has been added to the laboratory for original research work, including a compressometer of an improved electric contact type, a strain gauge and a special micrometer for concrete expansion and contraction measurements, designed and constructed in the office. A large reinforced-concrete storage tank for concrete specimens, and additional cement testing equipment have likewise been installed.

Research work in concrete has been carried on with increased vigor, including investigations of oil-mixed concrete, principally with reference to its road-building and water-proofing qualities, and a study of the expansion and contraction of concrete while hardening, a problem which is of much importance in connection with concrete pavements.

The results of these experiments have been published in the Proceedings of the American Society of Civil Engineers and in the Engineering News of October 12, 1911.

Research work is likewise being conducted with concrete water-proofing materials. In addition, investigations are now under way on road-building gravels and also on full-sized concrete-arch culverts, such as are used under roads. It is anticipated that many valuable data will be collected, which will be useful in the development of more economical and better designs for this class of structure.

OIL-MIXED CONCRETE.

A very important discovery—that of oil-mixed concrete—was made during the fiscal year 1910 in the progress of the development of a resilient, dustless, nonabsorbent road material capable of withstanding the severe shearing and raveling attacks of automobile traffic. Enormous strides have been made in the use of Portland-cement concrete in the last decade. The quality, however, of this material has not advanced in a corresponding degree. Although one of the most

universally used structural materials, because of its many good qualities, faults are apparent in its porosity and absorbent qualities and in its tendency to develop cracks, due not only to temperature changes, but to shrinkage while drying out in the air.

Yearly the use of concrete is increasing in road construction, in reinforced-concrete buildings, in sidewalks, basement floors, tanks, silos, and numerous other structures about the farm, and without doubt the curing of some of its present-day ills will render its usefulness more universal and vastly more efficient. It has been demonstrated through laboratory and service tests conducted by the office that some of the faults of plain concrete as ordinarily made may be eliminated at a very low extra expense, by the incorporation of a non-volatile mineral oil with the other materials in the mixture.

In October, 1909, it was discovered that a considerable quantity of oil could be combined with wet Portland-cement paste by a very simple mixing process, and, furthermore, that there was no separation of the oil from the paste after setting. The importance of this fact was recognized, and immediately investigations were begun on oil-mixed Portland-cement mortars and concretes, and during the present fiscal year a large series of laboratory tests was conducted, using a number of different types of oils and tar. In these experiments the various physical properties of oil-mixed mortars and concrete were investigated, including tensile strength, time of setting, crushing strength, toughness, elasticity, absorption, permeability, and bond to steel reinforcement. An enormous number of test specimens were molded for these experiments, requiring the construction of a large reinforced-concrete storage tank, built as an additional test of oil-mixed concrete. A 1:2:4 mixture was used, containing 10 per cent of oil based on the weight of cement. This tank is absolutely watertight. Laboratory tests show that, in general, oil has the following effects on mortars or concrete mixtures: Tensile strength, not decreased; time of setting is lengthened; crushing strength, somewhat decreased; toughness, not decreased; elasticity, not different from ordinary concrete; absorption and porosity, greatly decreased; and bond, slightly decreased.

These tests show the advantage of oil-mixed concrete in structures where a very inexpensive damp-proofing is desired, such as in pavements, basement floors and walls, shallow tanks, concrete building blocks, concrete roofs, etc. The indications of the usefulness of the material shown in the laboratory are now being borne out in service tests of basement floors, tanks, roofs, roads, bridge surfaces, etc.

The best method of preparing oil-mixed concrete is to mix together dry the required quantities of cement and sand until of uniform color, then to add water and mix to a mortar of the desired consistency. The required quantity of oil is then added to this mortar and mixed until it entirely disappears. The oil-mortar thus formed is then added to the previously moistened coarse aggregate and the mass is turned until thoroughly mixed. Ten per cent of oil based on the weight of cement in the mixture is all that is required to produce a concrete with very small water absorption and 5 per cent of oil is nearly as efficient. Roughly speaking, a mixture containing 5 per cent of oil will require 5 quarts (about one-half bucket) for every two bags of cement. In using a machine, experience has shown that oil-mixed concrete may be mixed most expeditiously by

placing sand and cement in the mixer and adding enough water to form a thin mortar. Oil is then added alternately with the stone until enough oil has been added to the batch, when the remainder of the stone is added and the mixing continued until completion. The types of oil best suited for oil-mixed concrete work are fluid residual petroleum.

Practical tests of oil-mixed concrete roadways are now in progress at the following places: Meridian Place, Washington, D. C.; Innis Street at Elm Park Station, Staten Island, running east from Morning Star Road to John Street; and two bridge floor surfaces at Ridgewood, N. J.¹ Oil-mixed concrete has likewise been used with good success in the construction of new vaults in the United States Treasury. These vaults were water-proofed by oil-mixed concrete mixed in the proportions of 1 part of cement, 2 parts of sand, and 4 parts of gravel, together with 10 per cent of oil. They have remained dry under very trying conditions.

These service and laboratory tests are exceedingly encouraging and indicate the possibilities of a very wide future usefulness of oil-mixed concrete in a great variety of construction.

A public patent, which has aroused much interest throughout the country, has been granted for mixing oil with Portland-cement concrete and hydraulic cements giving an alkaline reaction, so that anyone may use this process without the payment of royalties.

INVESTIGATIONS OF ROCK, SLAG, AND CEMENT.

The work carried on in the petrographic laboratory is essentially a continuation and extension of that of last year. Quantitative petrographic analyses of 141 rock samples were made, while 115 samples were qualitatively analyzed and 102 specimens were examined chemically for the purpose of identification.

Besides this ordinary routine work, the study of blast-furnace and open-hearth slags and Portland-cement clinkers was continued to determine the composition and physical properties of this class of road material. Up to the present time, 121 slag samples have been examined microscopically and 30 chemical analyses have been made. A classification of this material has been perfected, based on mineral and chemical composition, and this meets all practical requirements. The cementing value and other physical tests have demonstrated that the more basic slag varieties possess hydraulic properties similar to Portland cement, and they would, therefore, appear well suited for road binders as well as for certain kinds of concrete construction.

During the past year 23 samples of Portland-cement clinkers from various parts of the country have been examined microscopically and chemically, and a series of physical tests have shown that these clinkers may be ground with a large proportion of water-cooled blast-furnace slag to yield mixtures but slightly inferior in tensile strength to that of the neat cement. There is good reason to believe, therefore, that a small addition of Portland cement to blast-furnace slag screenings will greatly increase the cementing properties of the latter and render them more effective as road binders.

¹ A complete description of these experiments is published in Circular No. 94 of the Office of Public Roads.

It is expected in the following year to continue the laboratory study of slags and cements in connection with service experiments to determine the best means of utilizing them as road material.

CHEMICAL TESTS.

The work of the past fiscal year under this project comprised (1) the routine examination and analyses of bituminous and other road materials; (2) the standardization of the methods of examination of bituminous road materials; (3) chemical investigations and researches; (4) instruction of student and highway engineers in the chemistry of road materials; (5) the preparation of Government publications and various technical papers; (6) lectures and addresses; (7) the preparation of specifications for bituminous and other road materials; and (8) the inspection and supervision of bituminous road work and advice furnished thereon.

During the year 324 samples of various materials were received for examination in the chemical laboratories. This is nearly twice the number examined during the fiscal year 1910 and over four times the number examined in 1909. Of these, 38 were reduced and residual petroleums, distillates, etc., 88 oil asphalts, blown oils, and cut-back oil asphalts, 4 malthas, 32 native asphalts and fluxed native asphalts, 3 emulsifying oils and emulsions, 36 crude and refined water-gas tars, 47 crude and refined gas-house coal tars, 28 coke-oven tars, 2 crude and refined wood tars, 3 tar and asphalt mixtures, 6 rock asphalts and bituminous aggregates, 21 rocks, cements, brick, and gravel, and 16 miscellaneous materials not included under the above headings. A number of these analyses were made in conjunction with experimental field work of the office, and were reported in connection with these field experiments in Circular No. 94.

Considerable progress was made in the standardization of methods of examining bituminous road materials and valuable work in this connection was carried on in cooperation with a special committee of the American Society for Testing Materials, which has been at work along this line for a number of years past. A detailed description of routine methods in use in this laboratory was published in Bulletin No. 38, and about 20 methods are thus standardized for the office at present. It is believed that this work will aid materially in the adoption of uniform methods by other laboratories in this country which are interested in such examinations. This is a matter of the utmost importance at present.

While the increase in the number of samples tested during the year shows a considerable growth in the amount of routine work accomplished in the chemical laboratory, investigative work relative to the production and testing of bituminous material has not been neglected. Some results relating to the method for the determination of soluble bitumen and the composition of residues obtained in this determination, together with the results of a preliminary investigation on the effects of naphthalene in tars, have already been published.

The economic utilization of various coke-oven tars in the preparation of road binders has also been given consideration, and the results of this investigation will appear shortly in the form of a Government publication. Among other problems of a progressive nature

covering rather long periods of time are studies of the effects of light and of weathering on various bituminous materials, and the results will be published from time to time as sufficient data are accumulated.

In connection with the standardization of tests an exhaustive research was made toward the adoption of a standard method for the distillation of tars, and this work will continue through the coming year in conjunction with work of a similar nature on other routine tests. Improved apparatus for the extraction of coarse bituminous aggregates has been perfected and used to great advantage, and experiments looking toward the perfection of satisfactory apparatus for testing the binding value of bitumens have also been conducted.

The usual winter course of instruction in the chemistry of bituminous road materials and methods of testing them was given to five civil engineer students. The need for this special knowledge on the part of engineers has become so evident that the office has adopted the plan of having all its field force detailed to the laboratory, when convenient, for a thorough course of instruction, and, as a result, four of our superintendents of construction and three highway engineers have taken this course. That the value of such a course is appreciated by those outside of the office is shown by the fact that already two chemists have been detailed by their respective State highway commissions and received instruction in our laboratory methods.

During the year five papers prepared by the laboratory force were published either as Government reports or in the proceedings of technical societies, and one other, prepared in the fiscal year 1910, was not published until some time later. The latter was a paper on the "Determination of soluble bitumen," published in the Proceedings of the American Society for Testing Materials, and a paper on "The effect of traffic upon macadam roads surfaced with heavy oils," published in the Proceedings of the American Society of Civil Engineers. Of the papers prepared in this laboratory one is a popular article on the manufacture, classification, and use of bituminous road materials, two deal with the correlation of laboratory to field results, one is a report of original laboratory research, one is a compilation of definitions, and one contains a description of the methods of examination at present in use in our laboratories.

The laboratory force participated in the lecture work of the office to the extent of giving one popular talk on road materials at Kuna, Idaho, and delivering two scientific lectures—one before a class in civil engineering at the Iowa State Agricultural College, Ames, Iowa, and one before a class in civil engineering at Cornell University, Ithaca, N. Y. Two papers mentioned in the preceding paragraph were also read before technical societies.

The demand for specifications covering the various types of bituminous binders and bituminous road construction is continually increasing, and during the past year 81 copies were issued upon request. Their variety is best shown by division according to the following titles: Petroleum and petroleum products, 21; refined tars, 20; fluxed native asphalts, 10; construction, 11; oil-mixed concrete, 16; and sulphite liquor, waterproofing compound, and bridge-floor mastic, 1 each. These were distributed as follows: California, 1; Connecticut, 1; District of Columbia, 1; Idaho, 1; Illinois, 4; Indiana, 2; Iowa, 6; Maryland, 3; Michigan, 3; Minnesota, 3; Missouri, 1; Ne-

braska, 1; New York, 19; Oklahoma, 6; Ohio, 1; Pennsylvania, 4; Tennessee, 4; Virginia, 11; West Virginia, 4; Canada, 1; United States Reclamation Service, 1; United States Navy Department, 1; and United States War Department, 2.

Their influence is undoubtedly shown in the production of better and more uniform materials on the part of the manufacturers.

While great progress has been made in the improvement of methods of bituminous road treatment and construction during recent years, the subject is still in a stage of development, and the trained experts in this class of work are comparatively few. For this reason, and for the purpose of a better collaboration between laboratory experiments and field work, it becomes necessary for members of the laboratory force to spend a portion of their time in the field. During the fiscal year 68 assignments were made for the purpose of making inspections, giving advice, or supervising work on bituminous projects. These assignments covered 14 States and the District of Columbia, as follows: District of Columbia, 16; Georgia, 1; Idaho, 1; Illinois, 5; Iowa, 4; Maine, 2; Maryland, 6; Massachusetts, 1; New Jersey, 4; New York, 18; Ohio, 1; Pennsylvania, 1; South Carolina, 2; Tennessee, 1; and Virginia, 5.

The great increase in work accomplished over the previous year was largely due to improvement in working facilities after moving into the building at present occupied by the office, and also to the active interest taken by each member of the laboratory force in systematizing and improving its organization. Much time and thought has been put upon methods of perfecting each detail of the functions of the laboratory as related to the work of other branches of the office and the cooperation of the assistant chemists in this matter, which involved considerable unsolicited overtime work freely given, should receive high commendation.

But two additions to the laboratory force were made, one a laboratory helper appointed to replace the former helper who was assigned to the testing laboratory and a student assistant whose services were not secured until the latter part of June. The much-regretted resignation on November 1 of the assistant director, who had been directly in charge of the laboratories, brought the actual number of employees lower, therefore, than in the preceding year. At the close of the past fiscal year the force consisted of a chemist in charge, two assistant chemists, one student assistant, and one laboratory helper.

With the organization of the force thus far accomplished, it is hoped to increase largely the value of the laboratory through the continuation of the investigations already under way, and the institution of new researches, which are at present under contemplation. While there may have been an apparent contraction in the scope of work during the past year, it has become necessary to concentrate effort upon problems dealing principally with bitumens and their application to road construction and maintenance in order to meet the growing demand for information upon this subject. Judging from the results of the past few years, the routine work of the laboratory should largely increase in volume. For example, the standardization of methods is a matter of paramount importance demanding lengthy research; the study of the effect of essential con-

stituents in bituminous products is a matter for continued research, and the economic utilization of waste products in road construction is yet another important field for investigation. All this will cause the need for a gradual increase in the laboratory force.

With a view to increasing the efficiency of the present and future force, the organization of classes for outside study along lines that are particularly desirable or necessary for broadening one's knowledge in his chosen field will be undertaken. Seminars will also be held at stated intervals for the purpose of discussing current publications on road problems, as well as for the presentation of original papers by members of the laboratory force, and the discussion of methods for the improvement in the organization and efficiency of the work.

SPECIAL INSPECTION AND ADVICE.

There are many difficult problems which arise in connection with road work which can best be solved by local officials, after inspection and advice from the engineers, experts, and chemists of this office. The office has an arrangement by which assignments are made for this purpose, after applications have been received from road officials having jurisdiction over the roads to be improved.

Under this project 183 special assignments were made during the year, as follows: Alabama, 5; Arkansas, 2; California, 3; Delaware, 1; Florida, 4; Georgia, 4; Idaho, 3; Illinois, 1; Kansas, 5; Kentucky, 2; Louisiana, 39; Maine, 7; Maryland, 15; Massachusetts, 4; Minnesota, 2; Mississippi, 8; Nebraska, 4; New Hampshire, 1; New Jersey, 1; New York, 4; North Carolina, 5; Oklahoma, 4; Oregon, 1; Rhode Island, 2; South Carolina, 11; Tennessee, 9; Texas, 20; Virginia, 12; West Virginia, 3; and Wyoming, 1.

The work done under the above assignments may be classified as follows: Advice in regard—

(1) To various methods of road construction, including macadam, gravel, earth, sand clay, bituminous, slag, brick, and oiled gravel.

(2) To surveys for the proper location of roads.

(3) To the use of prisoners on roads and their management during the work.

(4) To the preliminary inspection of local conditions and the location of requested object-lesson roads.

(5) To experiments in new methods of construction.

(6) To the construction of bridges and culverts.

(7) To planning model systems of roads for counties and the best methods of their construction, maintenance, and administration.

(8) To bond issues for supplying the funds for road construction.

(9) To the use of the split-log drag.

(10) To the investigation and testing of road materials.

In addition to the above classified assignments the office sent its engineers to various States for the purpose of—

(11) Inspecting bituminous-macadam roads.

(12) Inspecting oiled-gravel roads.

(13) Inspecting oil-mixed concrete roads.

(14) Special inspection of various State roads already constructed.

(15) Preliminary study of conditions surrounding proposed inter-county or trunk-line roads.

Under the last item special mention should be made of the four following contemplated roads:

(1) Portions of the Memphis-to-Bristol Highway, in Tennessee, approximately 540 miles.

(2) A portion of the Central Highway in Carteret County, N. C., running from Beaufort to Craven County line, approximately 15 miles.

(3) A portion of the Charlotte-Wilmington Highway, in Columbus and Robeson Counties, N. C., approximately 95 miles.

(4) A portion of the route from Omaha, Nebr., to Julesburg, Colo., in Merrick County, approximately 50 miles.

Special surveys were made during the year in the following States: North Carolina, 2; Florida, 1; Tennessee, 2; and Nebraska, 1.

This branch of the work is constantly growing in importance. The staff of engineers, chemists, and experts of the office is developing into an effective corps of consulting specialists capable of offering reliable and effective advice concerning difficult and special problems which are not easily handled by local authorities. In this connection the work done in the State of Louisiana deserves special mention. Beginning with the construction of 16,200 feet of road at Pineville, in 1909, this office has been of assistance on roads in no less than 20 parishes, and there has developed in the State a sentiment for good roads sufficient to cause the enactment of a State highway law which provides for a State highway engineer. This law places funds derived from a half-mill tax on all property, approximately \$132,354 annually, for use in the construction of roads, on which the various parishes pay one-half the cost. The State law also provides for the use of State prisoners and sets aside the surplus revenue from the oyster and fish and game commissions for use in road construction.

It is also a source of satisfaction to this office that the State of Alabama has established a State highway commission and State highway engineer, with an annual appropriation of \$154,000 for building roads.

MODEL SYSTEMS—CONSTRUCTION, MAINTENANCE, AND ADMINISTRATION.

MOBILE, ALA.—From January 18, 1911, to March 6, 1911, an engineer from this office made a thorough study of the roads in Mobile County, and in particular of the roads under county supervision in the city of Mobile. Special attention was given to roads lying within the recently extended boundaries of the city. Mobile County has an area of 1,300 square miles and a total of about 2,000 miles of roads, about 1,200 of which are maintained as public roads. Except for a few miles of old shell roads around Mobile and the coast towns to the south, there are no improved roads, though the county is one of the most important in the State. A road map of the country was prepared and a general study of the topography, drainage, and superficial geology was undertaken. Recommendations based upon an analysis of the data obtained included suggestions for the development of park systems about the city of Mobile, the management of streets in the city subdivisions, and the treatment of bridges erected previous to 1900. Positive recommendations were submitted con-

cerning the kind and order of road construction to be undertaken. In view of the general deficiency of clay deposits it was advised that gravel or stone roads be built wherever the present earth roads could not be made to serve for a term of years. The construction of 32 roads of various kinds, having a total length of $119\frac{3}{4}$ miles and intended to supply the needs of 81 per cent of the population outside of Mobile, was suggested in some detail. The item of bridges to be built in the future received careful attention. Emphasis was placed upon the matter of maintenance in relation to the existing law, and general suggestions looking toward better methods of construction were offered.

WETUMPKA, ALA.—During September and October, 1910, an examination of the road conditions in Elmore County was made and suggestions were submitted for their improvement. Due consideration was given to the geographical conditions and the topography, together with the deposits of road materials within the county and the present financial condition. Upon the information developed along these lines a system was outlined. This system involves the issue of bonds to provide a road system of the greatest possible mileage within the resources of the county. Construction of sand-clay roads was recommended and a map was prepared locating roads to nearly every settlement and reaching every market, so as to serve approximately 97 per cent of the entire area involved. Advice was offered concerning the betterment of the county road administration and detailed specifications were made up for the construction of sand-clay roads and concrete culverts. A system of 39 roads, totaling $209\frac{5}{8}$ miles, at a cost of \$201,486, was projected. The character and order of construction, the number of culverts, and other details for all the above roads were worked out and their separate costs estimated.

DADE COUNTY, FLA.—Assistance and advice from this office was given to this county during January, 1911, with a view to systematizing the construction of county roads.

BROOKHAVEN, MISS.—The time of the engineer from this office at this point was partly occupied in prospecting for the best deposits of road gravel nearest to the various roads which it was contemplated to improve under an authorized issue of \$150,000 in bonds. The proceeds from the bond issue are to be expended under certain legal provisions, viz, that the road shall be let out by contract after having been surveyed by a competent engineer, and after plans, specifications, and estimates have been made. The services of the engineer from this office were also furnished in drawing up specifications and rendering other general assistance.

ALBUQUERQUE, N. MEX.—An investigation was made during July, 1910, of the highways in Bernalillo County, N. Mex. An examination of the condition of this county showed a valuation of taxable property of about \$4,000,000, and a population sparsely distributed, except in the irrigated district, which is about 3 miles wide and extends across the county 25 miles. In this section the population is dense and heavy crops are produced. The revenue for road and bridge purposes in 1909 was approximately \$9,000, derived from a levy of $2\frac{3}{4}$ mills and a theoretical per capita labor tax of \$3. In

addition, the commissioners were required to make a tax levy of a mill or less, to be expended within the county on a thoroughfare to be designated by the Territorial officials, but this road had not, at the time the office was called on for assistance, been so designated. An estimate of the maximum sum available for road and bridge purposes, based on the above conditions, was made and a system for its administration outlined. Specific recommendations as to the improvement of Fourth Street, between Albuquerque and Alameda, a distance of 6 miles, and involving an expenditure of \$1,500, were submitted. Estimated costs of permanent roads, for which present industrial conditions indicate a positive demand in the near future, were also made, involving an expenditure of \$100,000. This permanent construction will be demanded in the irrigated district for a distance of 25 miles. Finally an emphatic recommendation for the employment of an experienced highway engineer was presented.

HYDRO, OKLA.—At the request of the authorities of Hydro Township, advice was furnished concerning the proposed construction of 10 miles of macadam road leading from the town in three directions. A maximum issue of \$30,000 in bonds was contemplated. A study was made of the materials in the vicinity, together with the topographic conditions involved. Advice was furnished concerning a reduction of grades, the treatments of sandy surfaces, the construction of culverts, and the requisite width of macadam surfacing. Especial attention was given to the development of a crushed-stone supply, which seemed to be in a fair way of solution at the departure of the engineer. Further advice was given concerning the employment of county prisoners, the management of grading, and the work of culvert construction. Two miles of roads were surveyed and platted for the assistance of the authorities.

ROBERTSON COUNTY, TENN.—The purpose of this investigation was a reconnoissance survey to determine the most important roads in the county to be first developed, to estimate the detailed mileage cost within an authorized bond issue of \$150,000, and to indicate further what roads should be constructed as additional funds became available. To determine the most important roads, a study of the distribution of population was made, together with an investigation of the traffic conditions, and a definite order of the construction of 10 roads was recommended. The type of road determined upon for this county was limestone, water-bound macadam, and an approximate estimate of the cost of construction of the above-mentioned 10 roads was supplied. A plan for future development, involving the improvement of earth-feeder systems and their maintenance, was submitted.

The area of this county is about 475 square miles. There are about 145 miles of main public roads, which can not be greatly reduced. The total road mileage is probably not far from 500 miles and all the roads are of earth. The soil is red or brown clay overlying limestone. There are some deposits of bank gravel, with a low percentage of stone, which would apparently prohibit the use of this material. The principal crop is tobacco, a common load of which is two casks weighing 1,800 pounds each, hauled with four mules. The county has no bonded indebtedness.

ABILENE, TEX.—An engineer from this office was sent to Abilene, Tex., in November, 1910, to outline the installation of a system of

roads authorized under a \$150,000 bond issue for the precinct. This work involved recommendations to the county court for the employment of a general foreman, suitable engineer, and a patrol system of maintenance. These recommendations were based upon a thorough inspection of the precinct roads and an examination of the methods used at Brownwood and Waxahachie, operating under similar bond issues as that contemplated at Abilene. Proposals and specifications for road machinery, plans for culverts and bridges, and a method of bookkeeping were worked out and submitted. In addition an examination of available road stone and gravel was made and suitable tests for this material were arranged.

BASTROP COUNTY, TEX.—A general report to the commissioners' court at Smithville, Bastrop County, was made by an engineer from this office concerning information for handling a bond issue for road improvement in the second precinct, together with the general outline of roads to be improved and an estimate of the amount of money necessary. The commissioners' court at this place required merely general advice, and in view of the condition of the county it was suggested that they refrain from adopting a scheme of general improvement, devote the funds to bettering the bridges and culverts, and thus make certain excessively bad roads passable. It was proposed to form a road district in which the city of Smithville was the largest town, and to issue bonds for a system of roads and bridges. As a part of the report an estimate involving the sum of \$100,000 for the purpose of constructing 11 roads at some future time was submitted to the persons interested. General advice as to construction, administration, and maintenance was furnished.

A general report on the method of handling a bond issue for road improvement in precinct No. 1, in Bastrop County, Tex., was made by an engineer from this office to the commissioners' court. This report was based on a careful study of the general condition of the roads to be improved and the material at hand in the county, and involved advice concerning road location and construction. The question of administration was also studied and recommendations, with a detailed plan of organization, were submitted. The question of maintenance was discussed and recommendations were offered. The roads on which improvement was contemplated lead into Bastrop from all directions and are thoroughfares. Their improvement demands the construction of simple, graded roads on the hard, stiff soil. sand-clay construction on the sand and loam stretches, and gravel where the traffic is heavy and the material available. Various qualities of gravel and sand-clay were found. Separate estimates for the cost of construction of 11 roads of sand-clay or gravel were supplied with detailed plans and specifications and the necessary drawings.

BOWIE, TEX.—A report to the county authorities on the bond issue for road improvement in precinct No. 2 of Montague County, Tex., was rendered by engineers from this office. This is a contemplated bond issue, and suggestions as to the successful planning of the issue were made, together with details regarding the administration of it. An examination of the road material present in the precinct disclosed a good grade of clay and a surface formation of conglomerate suitable for bottom courses, some sand-clay hard-pan mixture, and a good grade of tough limestone, besides several deposits of gravel.

Further detailed study developed the location of the best available material in the vicinity of the several roads involved. A study of the existing road system and its condition, together with culverts and bridges, with a view to offering effective advice as to future location and relocation, was undertaken. Considerable assistance in the details of planning road construction of various kinds and the maintenance of completed roads was supplied. An approximate estimate of the cost per mile of a gravel road, crushed-stone road, and sand-clay road, together with drawings for them, form a part of the final recommendations.

BRAZORIA COUNTY, TEX.—A report to the authorities of Alvin precinct in this county on the method and cost of road improvement was made during June, 1911. The precinct covers approximately 260 square miles with level topography. The soil varies from dark sandy loam to a heavy prairie type. The industries are trucking, fruit growing, general farming, and cattle raising. The approximate valuation of the precinct is \$6,000,000. Four communities, lying within the precinct, will have to be connected by any system of roads that is adopted. An analysis was made of the present administrative methods and recommendations were made for their betterment with a view to a proper issue of bonds and the expenditure of their proceeds. An examination of the road material disclosed a decided deficiency, and certain types of shell construction were suggested. In addition, one gravel road was proposed, for which the gravel could be obtained for \$1.70 per cubic yard. Culvert and bridge designs were submitted and specific recommendations concerning grading, shell surfacing, and bituminous gravel construction were supplied. The matter of maintenance received careful attention. Estimates for the construction of 11 separate roads, amounting to 68.6 miles, were prepared. The estimated cost of these roads totaled \$373,411, and an issue of bonds to provide this amount was recommended.

HOWARD COUNTY, TEX.—A report was made by an engineer from this office to the commissioners' court of Howard County, Tex., for a plan of organization and an outline estimate of the work to be done under a \$100,000 bond issue for road and bridge improvement. Suggestions were added in regard to road machinery and road and bridge material. A general scheme of organization, involving the duties of the commissioners' court, the road superintendent and foreman, and the organization of a construction gang, together with a schematic chart of the whole, was submitted. The equipment of construction gangs, subdivided into grading gangs, claying gangs, road-machine gangs, and bridge gangs, was worked out. A general explanation of the subjects of location, surface improvement, road material and maintenance, and the construction of culverts and bridges was made. A detailed estimate of the cost of 10 roads, amounting to an expenditure of \$91,800, with \$19,700 additional for culverts, was submitted.

MILAM COUNTY, TEX.—A report on the improvement of roads in precinct No. 1, of Milam County, Tex., was made by an engineer from this office with a view to a bond issue. The report was in the nature of a preliminary outline to determine the character of the work and the available material. Precinct No. 1 covers approximately 190 square miles, is well watered, and contains rolling black

prairie land and also sandy soil land. The valuation of the county is \$7,500,000 on real property, the road mileage approximately 300, and the county has a population of 8,000. It is necessary to reach the communities of Buckholts, Yarrellton, Minerva, Ben Arnold, and Burlington by the proposed road system. Recommendations for the issuance of bonds and the administration of their proceeds were submitted. The administration was considered in detail. General suggestions concerning the use of available road material, the location of roads, the construction of culverts and bridges, and definite methods of construction and maintenance were supplied. An estimate of the cost of constructing nine special roads, including culverts, amounting to \$23,895, was given to the county. The total amount involved was \$248,749, and an issue of bonds for this expenditure was recommended.

MINERAL COUNTY, W. VA.—An inspection of the roads in Mineral County was made during March, 1911, and certain recommendations were submitted. The recommendations involved the designation of various individual roads to be improved, the methods of their improvement and their cost, and also the location of permanent cross-drains and the method of treating additional specified roads. Detailed drawings were furnished and a road map of the county provided. This work involved an examination of the present condition of the public roads in the county and a study of the county road administration provided by the State laws. Under the provisions of these laws certain suggestions for the effective operation of road administration were made. An analysis of the county valuation and its distribution, together with the road-tax rate and the distribution of mileage, form a part of the services rendered.

Abundant road material was found in this county, fairly well distributed, and included limestone and extensive deposits of gravel of various grades. The proper selection of these materials was advised.

EXHIBITS AND ROAD-IMPROVEMENT TRAINS.

An interesting feature of the year's work was the exhibits displayed by the office at expositions and on road-improvement trains. These exhibits consisted of models illustrating various types of improved roads and road-building equipment, similar to those which were prepared and displayed by this office at the Alaska-Yukon-Pacific Exposition.

The object of these demonstrations was to arouse interest in better roads and to instruct farmers and road officials in the fundamental principles of road construction and maintenance.

The models illustrate the construction of earth, sand-clay, gravel, macadam, brick, and bituminous-macadam roads. They are built to exact scale and are about 3 feet wide and 3 feet in length. The exhibits also include models of quarries with miniature crushing plants in actual operation. Other models show macadam roads, on which miniature steam rollers—built to scale—are in constant operation, illustrating the process of rolling.

One of these exhibits was displayed at Knoxville, Tenn., during the Appalachian Exposition, from September 12 to October 12, 1910, and another at Chicago, Ill., in the Coliseum, at the National Land

and Irrigation Exposition, from November 19 to December 2, 1910. The exhibits attracted so much attention at these expositions that various railroad companies applied to the office for the privilege of installing them on cars where they could be shown at the principal towns along their lines.

An arrangement was made with the Pennsylvania Railroad, the State highway department of Pennsylvania, and the Pennsylvania State College to cooperate with the office in operating a road-improvement train throughout the State of Pennsylvania. The train consisted of an exhibit car, which contained not only the models referred to above, but also a large number of enlarged photographs, illustrating various features of the road subject, and a set of pictures furnished by the Pennsylvania highway department.

A lecture car was provided in which stereopticon lectures were given during the day and evening at each stopping place by representatives of this office, of the State highway department, and of the State college. Two other cars were provided with exhibits consisting of full-size road-building machinery, including crushers, elevators and bins, and a number of homemade devices, such as split-log drags and concrete rollers.

The train started out on January 25 from Harrisburg, and completed its itinerary at State College on March 28. During that time, it stopped at 165 places, where the exhibits were displayed and 174 lectures were delivered. The success of this project is shown by the fact that approximately 53,000 people attended the lectures and examined the exhibits. In many places, the crowds were so large that the lectures were repeated. At other places, where the car would not accommodate the audiences, the meetings were held in court-houses, opera houses, etc.

Another train similar to that operated on the Pennsylvania Railroad was started out over the lines of the Southern Railway on May 1, 1911, and did not complete its itinerary before October 28, 1911. Up to the close of the fiscal year, approximately 12,000 people had examined the exhibits and heard the lectures on this train. Lectures were given on the Southern train by representatives of this office, the Southern Railway, and the American Association for Highway Improvement.

Negotiations are pending for the operation of similar trains on several of the largest railroad systems of the country, including the Frisco system, the Atlantic Coast Line, and the Nashville, Chattanooga & St. Louis Railroad.

An exhibit was prepared during the year for the International Exposition at Turin, Italy, beginning April 30 and closing October 31, 1911. This exhibit consisted of photographs and rock samples illustrating the methods of testing road materials in the laboratories of this office, models of the standard types of road construction, such as macadam and bituminous-macadam, and models of various types of machines used in this country in road-building.

LECTURES, ADDRESSES, AND PAPERS.

During the year 723 lectures and addresses were delivered in various parts of the country by 22 representatives of the office, as compared with 523 lectures delivered during 1910. The total attend-

ance at these meetings was a little over 200,000, including the meetings held in connection with the Pennsylvania Railroad and Southern Railroad good-roads trains, which amounted to about 65,000. All of these lectures were of a practical or scientific character, and most of them were illustrated with lantern slides.

The names of the States and the number of lectures given in each are as follows: Alabama, 108; Arkansas, 3; Colorado, 1; Delaware, 3; District of Columbia, 2; Florida, 5; Georgia, 18; Idaho, 9; Illinois, 16; Indiana, 5; Iowa, 2; Kentucky, 5; Louisiana, 1; Maine, 4; Maryland, 9; Michigan, 5; Mississippi, 33; Missouri, 3; Montana, 1; Nebraska, 2; New Hampshire, 1; New Jersey, 5; New York, 15; North Carolina, 24; Ohio, 7; Oklahoma, 7; Pennsylvania, 278; Rhode Island, 1; South Carolina, 53; South Dakota, 16; Tennessee, 46; Texas, 4; Utah, 5; Virginia, 22; and West Virginia, 4.

Most of the lectures were given at farmers' meetings, although this work included the delivery of lectures and the reading of several papers before road conventions and scientific organizations. The method of disseminating information by means of lectures has been productive of excellent results, and it is believed that it is one of the most useful and beneficial projects of the office.

PHOTOGRAPHIC LABORATORY.

The equipment of the photographic laboratory has been improved during the year, and the method of filing negatives, prints, and slides has been thoroughly revised. A vertical filing system has been adopted and a card index of all slides, negatives, and prints has been made.

The work of the laboratory during the year involved the development of 220 rolls of films, and making 446 negatives, 167 bromide enlargements, 2,028 lantern slides, and 11,841 prints.

At the present time the office has over 6,000 negatives in its collection, and approximately 5,000 lantern slides. Most of these slides have been colored by our own artist, and are used by representatives of this office in giving lectures. The office also has an arrangement by which lantern slides and data for use in lecture work are loaned to interested individuals and to representatives of scientific and other organizations.

It has been necessary during the year to print a larger number of negatives than in any previous year in order to complete the photographic files of the office. Photographic records of all object-lesson and experimental work conducted by the office and of all economic and field investigations are kept in this office.

STATISTICAL AND ECONOMIC INVESTIGATIONS.

An investigation begun in November, 1909, to ascertain the mileage of improved and unimproved roads in the United States and the cost of various types of construction, was completed about the close of the fiscal year 1911. This information is now being published in Bulletin No. 41, as a supplement to Bulletin No. 32, published in 1904. It is the purpose of the office to publish similar information

for each five-year period, in order to show the progress which is being made in each county in the United States.

The cost data contained in Bulletin No. 41 are the first which have been collected and published by the office, and it is believed that this information will be of great interest and value to road builders throughout the country.

According to the 1904 statistics there were 2,151,379 miles of public roads in the United States, not including Alaska and insular possessions, but, according to the 1909 figures, there were 2,199,387 miles. In 1904, 153,531 miles of roads were reported as improved, but in 1909 there were 190,467 miles improved. In other words, the percentage of all roads improved has increased from 7.14 per cent in 1904 to 8.66 per cent in 1909. The improved-road classification includes only such roads as have been properly graded, drained, and surfaced with hard material, such as stone, gravel, sand-clay, brick, shell, slag, etc., as well as those which have been surfaced with hard materials and treated with bituminous preparations.

During the spring of 1910 an investigation was begun to ascertain the economic effect of road improvement upon communities. In this work counties were selected in which the roads were exceedingly bad and in which bonds had been issued for the purpose of improving the main roads. A preliminary study of these counties was made after the bonds had been issued and the roads selected, but before the actual work of improvement had begun. The amount of bonds issued and the names of the counties included in this investigation are as follows: Spottsylvania County, Va., \$100,000; Dinwiddie County, Va., \$105,000; Lee County, Va., \$364,000; Wise County, Va., \$700,000; Lexington Township, Davidson County, N. C., \$100,000; Beat No. 1, Lauderdale County, Miss., \$200,000; Russell County, Ala., \$100,000; Dallas County, Ala., \$250,000; Manatee County, Fla., \$250,000; Wood Township, Clark County, Ind., \$10,000; Riverton Township, Mason County, Mich., \$20,000. The total amount of bonds issued in these counties is \$2,268,120.

A personal investigation and study is to be made in each of these counties and townships each year until the roads have been improved, and until the beneficial effects from such improvement can be clearly ascertained. The results already accomplished indicate that the final report on this project will be a powerful argument for road improvement.

Reports received from the principal shipping points in most of these counties indicate that the incoming shipments of farm produce far exceed the outgoing shipments. At the county seat, which is the principal shipping point of one of these counties, the incoming shipments of farm produce, as ascertained from the railroad company, in 1909 were 13,042,803 pounds, while the outgoing shipments were only 4,434,380 pounds. At another point in one of these counties the incoming shipments of farm produce during 1910 amounted to 13,120,986 pounds, while the outgoing shipments amounted to only 1,471,937 pounds. At the principal shipping point in another county the incoming shipments amounted to 8,262,724 pounds, while the outgoing shipments were 1,200,704 pounds.

The agricultural lands in the counties above referred to are considered fertile and, with improved roads, it is believed that they would not only produce enough for local consumption but would create a supply for shipment to other points.

A careful study is to be made in all of these counties before and after the roads are improved in regard to the value of the land, the character of crops hauled to market, the size of loads, the distance the various products are hauled to market, the cost of marketing crops, the areas under cultivation, the condition of schools and farm life, the efficiency of rural mail delivery, etc.

A careful photographic record is to be made of each of the roads. These photographs will show the condition of the roads before and after improvement, the methods of construction employed, as well as the character and extent of traffic before and after improvement.

In the counties where this investigation has now been in progress for two years it has been found that the price of land lying along the improved roads has already increased in value from 50 to 100 per cent. Heretofore the roads have been so bad that it has been a common practice in many of these counties to open the schools in August and close them during the early winter, so as to avoid the bad roads.

Extensive mining operations are carried on in two of the counties included in this investigation. The mining towns afford an excellent cash market for farm produce, but the local production does not begin to supply the demand. In fact the records of the railroad companies show that the incoming shipments of food products exceed the outgoing shipments at the rate of about 10 to 1, and that they are of the kind that could be produced in the counties to which they are shipped. One of the reasons for this condition of affairs is that the roads are so bad that hauling can not be done at a profit during a considerable part of the time.

Investigations dealing with road administration and road management have been inaugurated during the year. It is believed that when these investigations are completed and published the result will be a complete reorganization of the present system of road administration in many communities throughout the country.

Information is being collected in regard to the use of convict labor in road building, and taxation and bond issues for road improvement.

A complete list of road officials in every county and township in the United States is being compiled. This list will show not only the number of road officials but the character of the work which each class of officials performs. From present indications it appears that there are approximately 150,000 road officials in the United States.

The system of collecting and disseminating useful data relating to road improvement throughout the United States was improved during the year by the appointment of a special agent for each State. These special agents report on the first of each month concerning road activities in their respective States. In this way the office is kept in close touch with the progress of road improvement in each State.

LIBRARY.

The library of this office consists of about 3,000 volumes, among which are included the publications of all State highway departments, geological surveys, agricultural departments, and experiment stations, as well as those of various other State organizations which publish statistical information or data of interest to the officials and scientists of the office. We are also receiving the publications of the engineering departments of nearly all cities in the United States having more than 5,000 inhabitants. Foreign countries which are issuing reports concerning highway activities have also placed this office on their mailing list in exchange for similar courtesies from us.

We are receiving at the present time 64 periodicals, of which 26 are received from the department library and 38 are mailed direct from the publishers. Some of these periodicals contain comparatively little information that is of use to us, but all of them have at least some data which are valuable in our research work.

The cataloguing of the publications of the library is proceeding as rapidly as possible, and we have every reason to believe that this will be brought up to date during the present fiscal year.

The librarian of this office is now engaged in compiling a bulletin concerning road conditions and administration in foreign countries. The information for this publication is being drawn from the reports of American consuls and the printed information which they have secured from the Governments where they are stationed.

PUBLICATIONS.

The preparation of 15 publications has been carried on during the fiscal year 1911, but of these only 3 were issued during that year. These are: Bitumens and their Essential Constituents (Circular 93); Progress Reports of Experiments in Dust Prevention and Road Preservation (Circular 94); and the annual report of this office for 1910.

Eight other publications were prepared during the year and have since been issued. These are as follows: Descriptive Catalogue of Road Model Exhibits (Bulletin 36); Examination and Classification of Rocks for Road Building (Bulletin 37, revised edition); Methods for the Examination of Bituminous Road Materials (Bulletin 38); Highway Bridges and Culverts (Bulletin 39); Special Road Problems in the Southern States (Circular 95); Use of Concrete on the Farm (Farmers' Bulletin 461); Bituminous Dust Preventives and Road Binders (Yearbook Extract 538); and Progress and Present Status of the Good Roads Movement in the United States (Yearbook Extract 535).

There are four other bulletins on which a considerable amount of work was done during the fiscal year 1911. Two of these are nearing publication, namely, Bulletin 40 (Road Material Resources of Minnesota) and Bulletin 41 (Mileage and Cost of Public Roads in the United States in 1909).

Publications are now being prepared on the subject of Road Material Testing Laboratories, on the Condition and Administration of

Roads in Foreign Countries, and on Coke-oven Tars in the United States.

CLASSIFIED EXPENDITURES FOR 1911, BY PROJECTS.

Expenditures for fiscal year ended June 30, 1911, by projects.

Appropriations:

Salaries, Office of Public Roads.....	\$21,260.00
Road management.....	16,000.00
Investigating road building and maintenance.....	43,000.00
Road material.....	23,280.00
Administrative expenses.....	10,700.00

Total appropriation.....	114,240.00
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Projects:

1. Object-lesson roads.....	18,982.91
2. Instruction in highway engineering.....	5,363.30
3. Testing road materials (included in report for No. 31).....	0.00
4. Road management and accounting (included in report for No. 32).....	0.00
5. Lectures, addresses, and papers.....	10,806.36
6. Special inspection and advice.....	7,294.61
7. Dust prevention and road preservation (included in report for No. 30).....	0.00
8. Standardization of tests.....	1,103.37
9. Introduction of model systems of construction, maintenance, and administration.....	2,265.00
10. Investigation of road materials in the several States (included in report for No. 31).....	0.00
11. Sand-clay and burnt-clay roads (included in report for No. 1).....	0.00
12. Burnt-clay roads.....	0.00
13. Investigation of slag.....	750.00
14. Cooperation with county newspapers (included in report for No. 5).....	0.00
15. Corrosion of iron and steel.....	250.00
16. Split-log drag (included in report for No. 6).....	0.00
17. Classification of road materials (included in report for No. 31).....	0.00
18. Bibliography on roads.....	0.00
19. Administration and equipment.....	36,800.63
20. Traction tests.....	0.00
21. Inspection of rural-delivery roads.....	0.00
22. Illustrated lecture, photograph, and record work.....	3,356.66
23. Cooperation with experiment stations.....	0.00
24. Cooperation with Forest Service.....	0.00
25. Bridge investigations.....	1,425.45
26. Bulletins.....	1,491.54
27. Economic investigations (included in report for No. 32).....	0.00
28. Oil-concrete investigations.....	1,563.54
29. Surveys.....	1,997.98
30. Experimental roads.....	5,834.88
31. Testing, investigating, and classifying road materials.....	7,544.05
32. Road management and economic investigations.....	6,518.06

Total expenditures.....	113,348.34
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Balance unused, statutory roll.....	29.01
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Balance unused, miscellaneous rolls (estimated).....	862.65
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Total appropriation.....	114,240.00
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OUTLINE OF PLANS FOR THE CURRENT YEAR.

The work of the current fiscal year will not differ materially from the work of the last fiscal year. The appropriation for the current fiscal year exceeds that of the fiscal year 1911 by \$16,480, and it is therefore planned to increase the scope of the work in all its branches. In the appropriation bill for the current year \$10,000 was provided for experiments in road construction and maintenance. The work under this project has already started. Experiments are being conducted at Chevy Chase, Md., to determine by service tests the relative value of various bituminous materials applied by different methods, both in the construction and in the surface treatment of macadam roads. It is planned, if this appropriation is continued, to maintain these experimental sections of road for a term of years, keeping accurate cost data in order to determine the relative economy of the various types and methods of construction, taking into consideration the first cost as well as the maintenance charges.

Arrangements are being perfected to conduct experiments in Alexandria County, Va., in the maintenance of earth and gravel road by the patrol or daily maintenance method.

PLANS AND RECOMMENDATIONS FOR 1913.

The estimates for the fiscal year 1913 provide for an increase of \$70,176. In the event that the increase is granted, it is expected to broaden the scope of the advisory, lecture, object-lesson, and experimental work.

At the present time, the office can meet only a portion of the requests that are made for lectures and engineers.

It is recommended that the name of the office be changed from Office of Public Roads to Bureau of Public Roads.

REPORT OF THE SOLICITOR.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SOLICITOR,
Washington, D. C., October 19, 1911.

SIR: I submit herewith the report of the work of the Office of the Solicitor for the fiscal year ended June 30, 1911.

Very respectfully,

GEO. P. McCABE,
Solicitor.

HON. JAMES WILSON,
Secretary of Agriculture.

OUTLINE OF OFFICE WORK.

The greatest activity of this office since its creation in 1905 marked the period covered by this report. The necessary administrative machinery is now in working order to carry out the several regulative acts of Congress enacted in the past few years and intrusted to the Secretary of Agriculture for enforcement. Among these are the food and drugs act, the meat-inspection law, the acts for protection of the National Forests, the twenty-eight hour law, the live-stock quarantine act, the insecticide act, and the Lacey Act. The extent of the authority of administrative officers under these statutes, technical questions of procedure and practice in the trial of actual cases arising under these laws, and the correct interpretation of the more important provisions of the statutes have now, with a few exceptions, been pretty well settled by the courts. As a result, the work of this office has increased proportionately as the duties of administrative officers, inspectors, and other agents have become more sharply defined and better understood. The normal expansion along existing lines of activity in other branches of the department has also added greatly to the work of this office. The placing of the legal business of the Forest Service under my immediate direction has resulted in still further increasing the duties of the office and in greatly enlarging their scope.

The food and drugs act has been enforced vigorously and effectively during the year by the department and by the United States attorneys. There were prepared and reported to the Department of Justice 1,162 violations of the law, a larger number than in any one year previous and approximately 40 per cent of the number reported in the four and one-half years the act has been in effect. Of the whole number, 825 were criminal cases and 337 were recommendations for the seizure of adulterated or misbranded foods and drugs. There were 684 cases prosecuted by the United States attorneys during the

year, a marked increase over the number of cases presented in any one year previous, the number representing about 50 per cent of the cases brought to judgment up to June 30, 1911. In addition some 250 minor violations of the law, involving questions of labeling only, were corrected without recourse to the courts. In that class of offenses shippers voluntarily reformed their labels immediately on notice by the Solicitor of the exceptions taken by the Bureau of Chemistry to the branding.

Of the criminal cases prosecuted during the year, 386 resulted in convictions. As in previous years, defendants pleaded guilty in by far the greater number of these cases. Eleven of the criminal cases were decided adversely to the Government. Fines were imposed in the criminal cases amounting to about \$16,000, and, in addition, costs were generally assessed against the defendants. Of the cases reported during the year, 219 were pending in the courts at its close, and 351 reported late in the year were under consideration by the Department of Justice.

In the seizure cases decrees of condemnation and forfeiture were entered against 277 shipments of adulterated and misbranded foods and drugs. As heretofore, whenever seized articles of food were found to consist of filthy, decomposed, or putrid substances, or to contain added poisonous or deleterious ingredients which might render them injurious to health, the department has insisted that orders be entered directing the destruction of the goods. One hundred and fifty shipments of this class were destroyed. On the other hand, in the class of cases where the adulteration or misbranding was such that it could be cured by relabeling, the courts have usually released seized goods to claimants after relabeling whenever claimants have appeared and consented to the entry of decrees of condemnation and forfeiture, paid the costs of the proceedings, and filed bonds, as provided for by section 10 of the act, that the goods would not thereafter be sold or otherwise disposed of contrary to law. One hundred and twenty-seven shipments of this class were released during the year after relabeling and the providing of satisfactory bonds. There have been seized and destroyed large quantities of tomato catsup, tomato pulp, tomato paste, frozen and desiccated eggs, and black olives, found to be adulterated because they consisted in part of filthy, decomposed, or putrid substances. Several shipments of ice-cream cones containing boric acid have also been condemned and destroyed. The practice has been continued of reporting cases for criminal prosecution based on shipments of seized goods found to consist of filthy, decomposed, or putrid substances, or to contain added poisonous or deleterious ingredients which may render them injurious to health, and criminal prosecutions have been maintained successfully against shippers of such articles. More than 60 shipments of vinegars have been seized on the ground, for example, that they were represented on their labels as cider or apple vinegars, when they were found on analysis to contain dilute solutions of acetic acid and to be artificially colored. Shipments of this class have usually been released by the courts to claimants after the entry of decrees of condemnation and forfeiture and relabeling. Twenty-four seizure cases were discontinued, because evidence was not forthcoming on which to maintain them. In 12 cases seizures were abandoned because the goods had been disposed of prior to the filing of libels. Fifty-nine seizures made during the year were pending in the courts at its close.

Notices of judgment in the terminated cases have been prepared by this office promptly on receipt of the necessary records from the United States attorneys. Four hundred and forty-two of such notices were published during the year and over 200 more were in course of publication at the close of the year. Notices of judgment have been issued in the cases decided adversely as well as favorably to the Government. Advance copies of these notices have been forwarded to the officials of the several States authorized to cooperate with the department in the enforcement of the law. These notices serve a double purpose. They are an important factor in deterring the parties interested in particular notices from further violations of the law, and they inform the officials engaged in the administration of the food and drug laws as well as manufacturers and producers of foods and drugs generally of the interpretation placed by the department and by the courts on the provisions of the law defining adulteration and misbranding.

The office reported 598 instances of apparent violations of the twenty-eight hour law (act of June 29, 1906; 34 Stat., 607) in the fiscal year 1911, as compared with 438 cases similarly reported in 1910. Penalties aggregating \$26,075 were recovered and costs in the sum of \$5,783.85 were paid in 1911; in 1910 penalties in the sum of \$16,500 and costs in the sum of \$2,919.35 were assessed. Three hundred and fifty cases were disposed of in 1911, as compared with 187 cases disposed of in 1910. In 1911, 30 cases out of 284 resulted adversely to the United States; in 1910, 19 cases out of 158 terminated in favor of the defendants. Five hundred and fifty-nine cases were pending under this statute at the close of June 30, 1910, and 807 cases were pending at the close of June 30, 1911.

One hundred apparent violations of the live-stock quarantine acts were reported to the Attorney General during 1911, as compared with 148 cases during 1910. Of these, 90 were apparent violations of the act of March 3, 1905 (33 Stat., 1264), and 10 were alleged violations of the act of May 29, 1884 (23 Stat., 31). In all, penalties amounting to \$5,580 were imposed in the 51 violations of these statutes disposed of during 1911, as compared with fines amounting to \$2,970 in the 24 cases disposed of under the same statutes during 1910.

One hundred and one violations of the meat-inspection amendment (act of June 30, 1906; 34 Stat., 674) were reported to the Attorney General in 1911, as compared with 52 similar cases reported in 1910. Forty-three cases terminated in favor of the United States in 1911, fines or sentences of imprisonment being imposed; fines were assessed in the sum of \$3,240; 18 cases terminated in favor of the United States in 1910, and fines were assessed in the aggregate of \$2,397. In 1911, in 1 case there was a verdict for the defendant, 8 cases were dismissed, in 4 cases no true bills were found, and in 3 cases sentence was suspended; there were 74 cases pending under this statute at the close of June 30, 1911. In 1910, no cases were lost, 8 were dismissed for lack of evidence, and 26 were pending at the close of June 30, 1910.

The appropriation for the enforcement of the insecticide act of 1910 (act of April 26, 1910; 36 Stat., 331) became available March 4, 1911, (36 Stat., 1264). Several opinions have been rendered by the Solicitor on the construction of important sections of the statute, guaranties filed under section 9 are being examined, and the necessary legal work preliminary to the preparation of cases under the act is being performed.

The legal work of the Forest Service was placed under my immediate direction on January 15, 1910, and the report of this office for the fiscal year 1910 included a statement of the legal business transacted on behalf of that service from January 15, 1910, to June 30, 1910. Where reference is made in the present report to the legal work for the Forest Service transacted in the fiscal year 1910 this fact should be borne in mind.

During the fiscal year 1911 the Solicitor rendered 56 written opinions to officers of the Forest Service on the legal phases of questions arising in connection with the administration of the national forests; during the fiscal year 1910, 51 written opinions were similarly rendered. Four hundred and twenty-three agreements and 196 leases were prepared, and the sufficiency of the execution of the same examined during 1911, as compared with 53 agreements and 150 leases prepared during the fiscal year 1910. Two hundred and seven bonds were prepared in 1911, as compared with 47 in 1910. Two thousand three hundred and thirty-one cases involving contested claims to lands within the National Forests were handled during the fiscal year 1911, as compared with 565 cases of contested claims to lands within the National Forests disposed of during 1910. The regulations regarding the occupancy of lands in National Forests, in connection with the generation of hydroelectric power, were issued on December 29, 1910, as the result of conferences with the officials of the Forest Service, and on March 18, 1911, the regulations governing the subject of grazing on the National Forests were likewise promulgated. The regulations regarding special uses of lands in National Forests were similarly issued on March 18, 1911, and the portions of the National Forest code regarding trespass and timber sales were completed, though not issued at the close of the fiscal year 1911. Those portions of the code regarding settlement and claims were practically completed at the close of 1911. These regulations constitute a very complete code of rules governing the use and administration of the National Forests in every particular. Twenty-four cases were reported to the Attorney General for criminal prosecution and 12 actions for injunction as a result of grazing trespasses during 1911. Of the criminal cases, 11 resulted in convictions, \$800 in fines being imposed. Injunctions were granted in 8 of the 12 cases. In 86 cases an administrative settlement was effected, it being apparent that the trespasses were committed without criminal intent or knowledge. Remittances in the sum of \$2,000.04 have been received in 55 cases; the remaining cases will be settled during the present fiscal year. Thirty-five trespass cases were reported with a view to the collection of exemplary damages, recoveries being had in 13 cases in the sum of \$2,094.57 actual damages and \$817 exemplary damages. Outstanding judgments amount to \$317.50.

Nine hundred and fifty-eight agreements, 224 bonds, and 1 deed were prepared in 1911, as compared with 559 agreements and 87 bonds prepared in 1910.

Nine applications for letters patent on inventions of employees of the department for dedication to the public were filed in 1910, and a like number was presented in 1911. Of pending cases, 10 patents were allowed in 1911, as compared with 5 patents allowed and 1 disallowed in 1910.

The foregoing summary of the legal business transacted by this office on behalf of the department, while giving as much as can be expressed statistically, does not convey an adequate idea of the volume or character of the work actually done. An examination of the reports of the various United States attorneys will show that the legal business of this department has increased in volume and importance to a very marked degree during the fiscal year 1911. This, of course, does not take into account the legal business of the department which is not ultimately referred to the United States attorneys. I desire to make it a matter of record that the prompt and, I believe, efficient transaction of the legal business of the department has been effected through the devotion of the clerical force of this office. The work is current and as nearly up to date as conditions will permit.

It should be noted that in the following report no reference is made to any prosecution in tabular form, nor is the name of any defendant stated unless an indictment has been returned or an information filed in the case. The only reference to such cases is in the general summary, where a statement is made of the number of cases transmitted to the Attorney General for appropriate action during the fiscal year covered by the report.

ADMINISTRATION OF ACTS OF CONGRESS.

THE FOOD AND DRUGS ACT.

The new method of handling reports of food and drug cases, prescribed by General Order No. 140, effective July 1, 1910, has produced good results. This is evidenced from the increased number of cases reported and prosecuted during the year. Under the practice outlined by the order, complete reports have reached the hands of the prosecuting officers of the Government within a brief time after the violations have been committed. The cases have been handled promptly, and objections formerly raised to proceeding with the cases on account of the staleness of the offenses have been practically negligible. Full cooperation has existed between the Department of Justice and this department during the year. Several briefs have been written by the Solicitor at the request of the Attorney General and the United States attorneys, and frequent correspondence in legal questions presented in pending cases has contributed, it is believed, to the effective enforcement of the law.

In accordance with General Order 140, the Solicitor has examined the evidence of violations of the law reported by the Bureau of Chemistry to determine whether prima facie cases are presented and make recommendations to the Secretary of Agriculture whether citations should issue, and, after hearings had been held, whether cases should be reported to the Department of Justice. In making these recommendations the findings of fact by the Bureau of Chemistry have been accepted, and all the evidence available has been considered to determine whether violations of the law have been committed such as to warrant prosecution. No leniency has been shown in any case based on foods alleged by the Bureau of Chemistry to contain added poisonous or deleterious ingredients which might render them injurious to health. Regard has been had to the declaration of the Committee on

Expenditures in the Department of Agriculture in House report No. 1780, Sixty-first Congress, first session, that—

The prime object of the food and drugs act is the securing of wholesome food and properly labeled drugs for the people at large. The prosecutions involved are merely an incident toward this end and should be directed principally against those offenders who persist in their violations of the law after being fully informed as to its provisions and requirements.

And to the Secretary of Agriculture's directions of March 24, 1909:

That no prosecution shall be made for alleged violations of the food and drugs act when it is apparent that the alleged violation was the result of an honest mistake in interpreting the law and the absence of intent is plainly evidenced by the fact that as soon as the attention of the accused was drawn to the alleged violation he immediately and in good faith complied with the department's interpretation of the law and thereafter continuously conducted his business in accordance therewith.

Hearings were recommended on over 2,150 samples, and on approximately 650 samples no hearings were recommended. No violation of the law was apparent from the findings of the Bureau of Chemistry in over 20 per cent of these 650 samples. In regard to other samples no hearings were recommended for the reasons, among others, that evidence of interstate shipment was lacking, that the offense charged was trivial or technical, that the evidence of adulteration or misbranding was reported by the Bureau of Chemistry to be weak, that the Department of Justice had refused to prosecute for similar alleged violations, or the courts had decided them adversely to the Government, that manufacturers had been fined in similar cases and reformed the conduct of their business before the report of the Bureau was received, and that cases involving similar questions of law were pending in the courts.

After hearings had been held prosecution was recommended in over 1,250 cases, and in some 1,500 abeyance was recommended. Twenty per cent of the 1,500 cases were recommended for abeyance, because the offenses alleged by the Bureau of Chemistry were technical and the parties responsible for the products in question had reformed their labels; in 10 per cent the Bureau of Chemistry recommended no further action; in 10 per cent also the evidence offered to substantiate the charges of adulteration or misbranding was found to be insufficient on which to base prosecution; and in 15 per cent cases presenting the same questions were pending in the courts. Other reasons for recommending abeyance were adverse decisions of the courts in similar cases, no adulteration or misbranding within the definition of the law disclosed by the facts at hand, insufficient evidence on which to proceed against parties primarily responsible for the articles on which the cases were prepared, and the fact that certain articles had been shipped prior to the issue by the department of decisions stating its views as to labeling them. Fifty-seven seizures proposed by the Board of Food and Drug Inspection were rejected by the Secretary, on advice of the Solicitor, for similar legal reasons. In 245 cases reported by the Bureau of Chemistry as basis for criminal prosecution, where the exceptions taken to the labeling were deemed insufficient to warrant the calling of hearings or prosecutions, letters were addressed to the shippers calling their attention to the findings of the Bureau of Chemistry and requesting advice as to what action would be taken to insure the proper branding of future shipments. The shippers reformed their labels to meet the views stated in the letters, excepting 9 instances in which failure to reform was followed by recommendations for prosecution.

There were also examined the reports of the Bureau of Chemistry on 5,552 samples on which no cases were submitted by the bureau. The Solicitor agreed with the bureau that no further action should be taken on the samples, excepting on a comparatively small number of them. Letters were addressed to the manufacturers of 8 of the samples, pointing out particulars in which they did not meet fully the requirements of the law, and prosecution was recommended in 6 instances, when investigation showed that the evidence obtained warranted such action.

Cooperation with the department by some of the State food and drug officials has continued throughout the year. Under the practice, as prescribed by the regulations and instructions issued by the Board of Food and Drug Inspection, cases based on samples collected and examined by the collaborating officials, after consideration by the department, have been reported to the Attorney General when the results of the investigations have warranted such action. Plans looking to the furtherance of cooperative work were laid at a conference with the department by a committee of the Association of State and National Food and Dairy Departments for presentation at the annual meeting of the association in August. It is believed that the adoption of the plans devised by the committee will produce increased activity on the part of collaborating officials in the enforcement of the law.

Two important cases under the food and drugs act were decided by the Supreme Court of the United States during the year. The first was *Hipolite Egg Co. v. United States* (220 U. S., 45). The case grew out of the seizure of 50 cans of preserved eggs, under section 10 of the act, in the southern district of Illinois. A decree of condemnation and forfeiture, with costs, was entered by the trial court, and the *Hipolite Egg Co.* appealed, asserting that the court was without jurisdiction because the eggs had not been shipped for sale within the meaning of the food and drugs act, and further that the court was without jurisdiction to assess the costs of the proceedings against the company. The decree below was affirmed, and the Supreme Court held that adulterated articles of food, which have been transported in interstate commerce, are subject to seizure and condemnation as long as they remain in the condition in which they were transported; that is, "in the original, unbroken packages." The jurisdiction of the district court to assess costs was also upheld. (220 U. S., 45; Notice of Judgment No. 1043.)

United States v. Johnson (221 U. S., 488; Notice of Judgment No. 1058) was decided adversely to the Government. In this case misbranding was alleged of a so-called "mild combination treatment for cancer," consisting of several packages, bearing statements that the treatment would effect the cure of cancer. The indictment alleged that these statements were false and misleading statements regarding the article, and that the drug was misbranded because analysis showed the treatment to be worthless and ineffective for the pretended purpose. On defendant's motion to quash the District Court for the Western District of Missouri held that inquiry under the food and drugs act does not extend to the question whether a product is effective or worthless to accomplish the results claimed for it on the label (177 Fed., 313; Notice of Judgment No. 266). The judgment of the district court was affirmed by the Supreme Court (221 U. S., 488; Notice of Judgment No. 1058). Following this

decision the President addressed a message to Congress on June 20, 1911, urging the immediate necessity for remedial legislation.

The circuit court of appeals for the sixth circuit handed down an important decision in *United States v. George Spraul & Co.* (185 Fed., 405; Notice of Judgment No. 1044; Circular No. 47, Office of the Solicitor.) Seizure was made by process of libel for confiscation, under section 10 of the food and drugs act, of 275 cases of adulterated catsups, claimed by George Spraul & Co. The libel alleged adulteration because the catsup consisted wholly or in part of a filthy, decomposed, or putrid vegetable substance, and prayed the process of attachment according to the course in cases of admiralty and maritime jurisdiction. Claimants demurred on the ground that the libel contained no allegation of previous seizure. The district court sustained the demurrer and ordered the dismissal of the libel. The United States excepted to the order, and the court of appeals, after full consideration, held that previous executive seizure of adulterated or misbranded goods is not necessary to give jurisdiction in seizures under the food and drugs act, but that such seizures are properly made by warrant issued after the filing of libels, and directed that the order below sustaining claimants' demurrer be reversed. (185 Fed., 405; Notice of Judgment No. 1044; Circular No. 47, Office of the Solicitor.)

Proceedings under section 10 of the act were also the subject of a decision of the circuit court of appeals for the second circuit in *United States v. 20 Cases of Grape Juice*. (Notice of Judgment No. 1045.) Seizure was effected in the western district of New York of a quantity of grape juice alleged to be adulterated because glucose had been substituted in part for grape juice, and to be misbranded because it was not pure grape juice; and, further, because some of the bottles were short in volume and others were short in weight. Claimants demurred to the libel on account of failure to allege that notice of the examination of samples by the Bureau of Chemistry had been given to the claimants and an opportunity for hearing afforded them. The demurrer was overruled, because it did not appear from the record whether the seizure had been made at the instance of the Department of Agriculture or by the United States attorney on his own motion. (*U. S. v. 74 Cases of Grape Juice*, 181 Fed., 29.) The case subsequently came on for trial, and, on claimants' motion, a verdict was directed in their favor, on the ground that no notice had been given to the parties interested in the grape juice, under section 4 of the act, prior to the filing of the libel.

An appeal was taken, and the circuit court of appeals affirmed the decision, holding that all the sections of the act are interdependent, and when United States attorneys act upon reports of the Secretary of Agriculture there must be a preliminary investigation, including notice and hearing by the Secretary. (189 Fed., 331; Notice of Judgment No. 1045.) This decision is contrary to the decisions of six district courts that no hearing before the Secretary of Agriculture need precede the filing of libels for condemnation in the following cases: *U. S. v. 50 Barrels of Whisky* (165 Fed., 966); *U. S. v. 65 Casks of Liquid Extract* (170 Fed., 449, 454); *U. S. v. 9 Barrels of Olives* (179 Fed., 983); *U. S. v. 100 Cases of Tepee Apples* (Notice of Judgment No. 36); *U. S. v. 36 Cases of Metabolized Cod Liver Oil* (Notice of Judgment No. 303); *U. S. v. 100 Barrels of Vinegar* (Notice of Judgment No. 1159); and in the *Hipolite egg case*, *supra*, the Supreme Court held that sections 2 and 10 are

not dependent on each other. The circuit court of appeals, in concluding that the sections of the food and drugs act, particularly sections 2 and 10, are interdependent, in effect likens suits for forfeitures under the food and drugs act to suits for forfeitures under the revenue and customs laws. Proceedings to effect forfeitures under the revenue laws have been held to be quasi criminal in their nature, because they are proceedings against the owners of the property as well as against the goods, and the owners' breach of the laws must be proved to establish forfeitures. Suits for forfeitures under the food and drugs act, on the other hand, are conducted without regard to the question whether the owners of the goods have committed offenses described by sections 1 and 2. Heretofore section 10, which makes no provision for hearings, has been construed by the courts to be complete in itself and to define fully the conditions under which adulterated and misbranded articles are liable to seizure and forfeiture as well as the procedure by which such seizures shall be made, namely, as near as may be to proceedings in admiralty. Preliminary hearings are no part of proceedings in admiralty. No steps were taken by the Attorney General to obtain a review of the decision by the Supreme Court because the effect of section 4 of the act is involved in *U. S. v. Morgan*, there pending.

The circuit court of appeals for the fifth circuit affirmed decrees of condemnation entered by district courts in *United States v. 2,000 Cases of Canned Tomatoes*, R. G. Charles, claimant (Notice of Judgment No. 875), and *United States v. 1 Barrel of Vanilla*, Warner-Jenkinson Co., claimants (Notice of Judgment No. 1166).

In *Nave-McCord Mercantile Co. v. United States* (182 Fed., 46) the circuit court of appeals for the eighth circuit reversed the judgment of the court below in favor of the United States and held that defendant's demurrer should have been sustained, for the reason that the information failed to aver sufficient facts to constitute a violation of the food and drugs act (182 Fed., 46; Notice of Judgment No. 895).

The circuit court of appeals for the second circuit, in *United States v. 300 Cans of Frozen Eggs*, European Egg Co., claimant, decided it is unnecessary to allege in libels for condemnation and forfeiture of adulterated foods under the food and drugs act that such foods which remain unloaded, unsold, or in original unbroken packages after transportation from one State to another were transported for sale. The case arose out of the seizure, in the southern district of New York, of a quantity of frozen eggs alleged to be adulterated, in that they consisted wholly or in part of filthy, decomposed, or putrid substances, and was decided on the authority of *Hipolite Egg Co. v. United States*, supra (189 Fed., 351; Circular No. 55, Office of the Solicitor). The decision of the District Court for the Southern District of Ohio that a libel for condemnation under section 10 is fatally defective for failure to allege that seized goods had been transported for sale, in *United States v. 46 Packages of Sugar* (183 Fed., 642), was made prior to the decision of the Supreme Court in the *Hipolite* case.

The constitutionality of the act was unsuccessfully attacked in *United States v. Lehn and Fink*, prosecuted in the Circuit Court for the Southern District of New York. The information charged adulteration of a quantity of jalap which had been shipped in interstate commerce, because the drug was sold under a name recog-

nized in the United States Pharmacopœia and differed from the standard of strength, quality, and purity for jalap as determined by the test laid down in the Pharmacopœia official at the time of investigation, and misbranding was charged because the strength of the drug differed from the strength indicated by the label. Defendant demurred on the ground that the provisions of section 7 of the act under which adulteration was alleged was unconstitutional as being *ex post facto* and an improper delegation of legislative authority, and that the count alleging misbranding of the drug was defective because it failed to state that the label was false and misleading. In overruling the demurrer the court held that the word "investigation" used in section 7 of the food and drugs act is not necessarily identical in meaning with the word "examination" used elsewhere in the act, and section 7, which declares a drug to be adulterated if it "differs from the standard of strength, quality, or purity as determined by the test laid down in the United States Pharmacopœia * * * official at the time of investigation," is not *ex post facto* legislation. The amenability of shippers to prosecution under section 2 depends on the fact existing at the time when shipment takes place, and no offense is committed in shipping a drug conforming at the time of shipment to standards then in force, even though subsequently a drug may be found on examination not to conform to other tests which at the time of the examination have become operative as to further shipments of the drug. It was further held that Congress, in providing that a product shall be deemed to be adulterated if it fails to comply with the test laid down in the pharmacopœia or national formulary official at the time of investigation did not delegate legislative power, but merely prescribed the method of ascertaining facts upon which the operation of the statute was to depend, and that the words "false" and "misleading" as used in section 8 of the act are of the same import, and either or both may be used indifferently in an information charging the misbranding under the act (Circular No. 49, Office of the Solicitor).

In the northern district of California a domestic wine labeled "Champagne," without qualifying words, was held to be misbranded, for the reason that the term when used alone is commonly understood to describe an effervescent or sparkling wine produced in a province of France, the gas therein being a product of natural fermentation. It was also decided that in a criminal prosecution under section 2 of the food and drugs act it is not necessary for the Government to charge or prove compliance by the administrative officers with the provisions of section 4 of the act, whether the hearing therein prescribed has or has not taken place. *United States v. Schraubstadter & Groezinger* (Notice of Judgment No. 1020). This decision with respect to the effect of section 4 is contrary to the decision of the circuit court for the southern district of New York in *United States v. Morgan* (181 Fed., 587). *Morgan* was indicted for shipping in interstate commerce misbranded spring water. He was tried before a jury, which returned a verdict of guilty. Thereupon defendant's counsel filed motions for a new trial and in arrest of judgment on the ground, among others, that the indictment failed to allege, and the Government had offered no proof, that notice had been given to the defendants by agents of the Department of Agriculture of the examination of samples obtained of the water and an opportunity given them to be heard

on the question whether the law had been violated. The indictment was held to be defective and the motion in arrest of judgment granted, the court holding that a compliance with section 4 of the act is a prerequisite to prosecution in all cases brought before United States attorneys for prosecution by the Department of Agriculture (181 Fed., 587). From this decision an appeal was directed by the Attorney General to the Supreme Court, where the case is now pending.

Three interesting questions were decided by the district court for the eastern district of Pennsylvania in *United States v. 5 Boxes of Asafoetida* (181 Fed., 561). Libel was filed against a consignment of asafoetida in the possession of the Smith, Kline & French Co. Adulteration was alleged because the drug differed from the strength, quality, and purity, as determined by the test laid down in the Pharmacopœia. Evidence produced at the trial showed that before the service of the attachment the claimants opened the packages, took samples therefrom for examination, and marked the containers so as to show the actual strength, quality, and purity of the asafoetida. Claimants urged the dismissal of the libel, alleging no forfeiture could be had because the facts in the case would not support a criminal prosecution against them, that the sampling of the packages destroyed their character as "original packages," and that the labeling of the packages before seizure relieved them from liability to forfeiture under the terms of section 10 of the act. It was held that section 10 defines fully when and under what circumstances foods and drugs shall be forfeited, and is separate and distinct from section 2, and it is unimportant in forfeiture proceedings, whether any person on the same state of facts could be convicted under section 2. The taking of samples for the purpose of examination was decided not to destroy the commercial form of the packages and not to incorporate the goods with the property of the State so as to remove them from the jurisdiction of the act over original packages. Liability to seizure, however, was held to depend on the question whether articles are adulterated or misbranded at the time of seizure, and as the containers were properly marked and the drug therefore was not adulterated at the time of seizure, the court directed the release of the asafoetida to the claimants (181 Fed., 561).

The practice of proceeding by information in criminal prosecutions under section 2 of the act was approved in *United States v. J. Lindsay Wells Co.* (186 Fed., 248). The information filed against this defendant charged the shipment of certain adulterated cotton-seed meal, and defendant moved to quash the information on the ground that the prosecution was in violation of the fifth amendment to the Constitution, which provides that no person shall be held to answer for a capital or infamous crime unless upon presentment or indictment of a grand jury. Violation of section 2 of the food and drugs act was held not to be an infamous crime, because the maximum period of imprisonment which may be imposed thereunder does not exceed one year, and proceedings under the section, therefore, not to be in conflict with the fifth amendment and may be by information in lieu of indictment (182 Fed., 248). To the same effect is *United States v. Baumert et al.* (179 Fed., 735), where it is decided that prosecutions under section 2 of the food and drugs act may be instituted by information supported by the affidavits of parties making oath

or affirmation as of their knowledge to the facts constituting the offense created by the section.

In *United States v. American Druggists Syndicate* (186 Fed., 387), prosecuted in the eastern district of New York, an information was filed alleging that a so-called "Peroxide Cream" was misbranded because it contained an inconsiderable quantity of peroxide, and further because there was inclosed with the article a circular containing a false representation that the article was a pure skin cerate. Defendant demurred to the information, and in sustaining the demurrer the court, construing the Government's contention that the article was misbranded because it failed to contain peroxide as an important ingredient to be, in effect, a contention that the article did not possess the remedial effect claimed for it, held that false or misleading statements of this character do not fall within the scope and purpose of the food and drugs act; and further, that advertising circulars inclosed with articles inside the cartons in which they are offered for sale do not induce sales nor deceive prospective purchasers, and false and misleading statements therein do not amount to a misbranding under the meaning of the act (186 Fed., 387). The department is unable to accept the view that the name "Peroxide Cream" is not a statement regarding the article and the ingredients or substances contained therein and does not amount to a representation that peroxide is a substantial ingredient, nor the view that false and misleading statements contained in circulars inclosed with packages of drugs are not statements borne by the package or label within the definition of section 8 of the act. As the state of the record did not permit the taking of steps to secure a review of the decision, at the suggestion of the Attorney General new cases are in course of preparation for prosecution presenting similar questions.

The term "Oat Feed" was defined by the district court for the northern district of Alabama in *United States v. 1 Carload of Corno Horse and Mule Feed* (188 Fed., 453) to mean the by-product of the oat, and a libel alleging misbranding of stock feed on the theory that the name "Oat Feed" means ground whole oats was dismissed (188 Fed., 453).

In *United States v. 2 Barrels of Desiccated Egg* (185 Fed., 303) the district court of Minnesota overruled claimant's exceptions to the libel and stated the following propositions of law: (1) Seizures under the food and drugs act are properly made by a warrant of arrest following the filing of a libel for condemnation and forfeiture; (2) libels filed on behalf of the United States need not be verified; (3) libels for condemnation and forfeiture of adulterated foods are not defective for failure to allege the date when such foods are shipped in interstate commerce; (4) adulterated eggs transported from one State to another to be used in the manufacture of other products are liable to seizure under the food and drugs act; (5) adulterated food is liable to seizure after interstate shipment while the food remains in original unbroken packages (185 Fed., 303). This decision follows closely *Ilipolite Egg Co. v. United States*, and *United States v. George Spraul & Co.*, supra.

In *United States v. 10 Barrels of Vinegar* (186 Fed., 401), the construction of paragraph 4 of section 8 of the act, in case of food, was drawn in question. Claimant of the goods labeled "Saratoga Brand Vinegar" in large print, then in smaller type "pure boiled apple

cider," and in large print "distilled vinegar" contended that when the ingredients of a food are stated and the term "blend" is also displayed on the label, such food can not be held to be misbranded or adulterated, because, in conformity with the act, they are labeled so as to indicate that they are blends and the word blend is plainly stated on the packages in which they are offered for sale. In overruling claimant's exceptions to the libel, it was held that inasmuch as the word "blend" is construed by the act to mean a mixture of like substances, the word "blend" is a representation that a mixture consists of like substances, and in the present case conveyed the impression that the article was a mixture of distilled vinegar and cider vinegar; and, since no cider vinegar was present, the label was misleading and deceptive and the mixture therefore misbranded (185 Fed., 403).

The case of the *United States v. 40 Barrels and 20 Kegs of Coca Cola*, tried in the district court of the United States, at Chattanooga, Tenn., resulted in a verdict, under the instructions of the court, adverse to the Government. Condemnation of the coca cola was sought under section 10 of the act on the ground that it was adulterated because it contained an added poisonous and added deleterious ingredient, viz, caffein, which might render it injurious to health, and because it had been mixed, colored, and stained so as to conceal damage and inferiority, and on the further ground that it was misbranded because the coca cola was an imitation of and offered for sale under the distinctive name of other articles, and because the packages and labels bore false and misleading statements regarding the coca cola and its ingredients. After evidence had been presented by both parties the claimants moved the court for instructions to the jury to return a verdict in their favor, counsel for the claimants urging that the coca cola was sold under its own distinctive name and not under the distinctive name of other articles, that the caffein in coca cola was not an added ingredient, but an essential ingredient of the mixture as compounded and sold for many years, and consequently, as matter of law, that the coca cola was neither adulterated nor misbranded in view of the proviso contained in paragraph 4 of section 8 of the act in the case of foods, wherein it is provided that an article of food which does not contain any added poisonous or deleterious ingredients shall not be deemed to be adulterated or misbranded in the case of mixtures or compounds which may be now or from time to time hereafter known as articles of food, under their own distinctive names, and not in imitation of or offered for sale under the distinctive name of another article, if the name be accompanied on the same label or brand with a statement of the place where such article has been manufactured or produced.

Construing the meaning of the word "added" in the proviso, the court held, in effect, that an ingredient which habitually enters into a mixture or compounded food in the form and with the characteristics with which the mixture has acquired its distinctive name and become known to the public, is not added to the mixture, and the mixture can not be said to contain an added ingredient on account of the presence of one of its normal and usual constituents. In other words, it was held that the terms of the proviso assimilate compounds and mixtures labeled and sold under their own distinctive names to natural articles of food, and that such articles, therefore, can not be deemed to be adulterated, whatever the character of their ingredients,

if the compounds or mixtures contain no ingredient other than those entering in the customary process of manufacture. This department is unable to accept this decision as correct, because it operates to exclude from the prohibitions of the act all mixed and compounded articles sold under arbitrary or fanciful names.

Immediately on notice of the decision of the court the Attorney General, at the request of the Secretary of Agriculture, directed the attorneys in charge of the case to take the necessary steps to obtain a review. The Government's motion for a new trial was overruled, and the case is now pending before the court of appeals for the sixth circuit on writ of error.

The case of the United States *v.* 443 Cans of Frozen Egg Product (Notice of Judgment 1027), tried in the district of New Jersey, was also decided adversely to the Government. In this case the libel prayed condemnation of a quantity of frozen egg product on the ground that it was adulterated, because it consisted wholly or in part of filthy and decomposed animal substances, and also on the ground that sugar had been mixed and packed with the product and substituted for eggs. The case was tried by the court without a jury, and it was held that the evidence presented by the Government was insufficient to establish the presence in the product of filthy and decomposed substances, and that the product could not be held to be adulterated on account of the presence of sugar, because it was made just as it was ordered and directed to be made. An appeal on the questions of law and fact was taken by the Government and the case is now pending before the court of appeals for the third circuit.

A libel was filed in the Supreme Court of the District of Columbia praying the condemnation of a quantity of antikamnia tablets on the ground that they were misbranded. The labels on different packages of the products in question bore the following statements: "Contains 305 grains of acetphenetidin," "contains 296 grains acetphenetidin," and "contains 165 grains acetphenetidin." Each package of tablets also bore the following statement: "The * * * tablets in this original ounce package contain no acetanilid, antifebrin, acetphenetidin, morphin, etc." Misbranding was alleged because the label on the packages failed to declare that the acetphenetidin present therein was a derivative of acetanilid, and for the further reason that the statement "contained no acetanilid" was false and misleading. Prior to the filing of the libel, on January 15, 1909, Attorney General Bonaparte held that the labeling of derivatives of drugs, specified in section 8 of the act, is a proper subject for regulation by the three Secretaries, and that a rule or regulation requiring the name of a specific substance to follow that of a derivative would be in harmony with the purposes of the act and an appropriate method by which to give effect to its provisions. In conformity with this opinion, a regulation was made by the Secretary of the Treasury, the Secretary of Agriculture, and the Secretary of Commerce and Labor, on January 27, 1910, providing that, in declaring the quantity or proportion of derivatives of any of the substances specified in the act, in addition to the trade name of the derivative, the name of the specified substance shall also be stated, so as to indicate clearly that the product is a derivative of the specified substance.

The validity of this regulation was attacked by claimants' exceptions to the libel, which were sustained by the trial court. The Government appealed to the Court of Appeals for the District of Colum-

bia, and the judgment of the trial court was affirmed, the court of appeals holding, in effect, that no authority of law exists for regulating the declaration on labels that the derivative of a specified substance is a derivative of such substance, and, further, that the allegation of the libel that the statement "contained no acetanilid is false and misleading and constitutes misbranding under the law" was insufficient, because it did not expressly charge that acetophenetidin contains acetanilid, and, consequently, the charge of misbranding was limited to the failure to state that acetophenetidin is a derivative of acetanilid. Thereupon, appeal was taken to the Supreme Court of the United States, where the case is now pending (Notice of Judgment 1056).

Claimants' appeal in the Kansas City bleached flour case, in which a decree of condemnation was entered in July, 1910, against a quantity of flour bleached with nitrogen peroxide on the ground that it was adulterated and misbranded, by the District Court for the Western District of Missouri, in July, 1910, was argued before the court of appeals for the eighth circuit in May, and the case is now under consideration by the court of appeals.

The appeal taken by J. G. Dorn and Thomas F. Cunningham, from the judgment of the district court for the eastern district of Louisiana in favor of the United States for \$1,000 on account of the violation of the terms of a bond filed by the defendants to secure the release of wine condemned for adulteration and misbranding, was heard by the court of appeals for the fifth circuit. The judgment of the district court was affirmed.

Defendant's motion for a new trial in *U. S. v. Tucker* (188 Fed., 741) was overruled. Tucker, on receipt of a symptom blank from an inspector of the Department of Agriculture, at different times, deposited in the mail at Mount Gilead, Ohio, addressed to the inspector at Washington, two bottles of a medicine, represented as a specific for asthma, hay fever, catarrh, etc., which contained cocaine. No declaration was made on the bottles that the drug contained cocaine. On trial for the shipment of a misbranded drug in violation of section 2 of the act, the jury returned a verdict of guilty, and Tucker moved to set aside the verdict on the ground that he was engaged in intrastate and not in interstate commerce. The court held that the transaction was interstate commerce, overruled the motion, and imposed a fine of \$150 and costs on the defendant.

Beginning at page 58 of this report will be found tables showing in detail the cases arising under the food and drugs act in which proceedings were begun or terminated during the fiscal year 1911.

THE TWENTY-EIGHT-HOUR LAW.

ENFORCEMENT OF THE ACT.

During the fiscal year 1911 the enforcement of the twenty-eight-hour law (act of June 29, 1906, 34 Stat., 607) proceeded vigorously and effectively. The department reported to the Attorney General 598 instances of apparent violations of the statute in that period. This is 160 cases more than were similarly reported in the fiscal year 1910, 438 cases being transmitted to the Attorney General in that fiscal year. Having regard to the normal growth of the traffic in live stock, it may be fairly said that during the fiscal year just past there

has been at least no marked improvement in the determination of common carriers to obey the law, as evidenced by the statistics of the enforcement of the law for the fiscal year 1910. Of the 598 cases reported, together with those coming over from the fiscal year 1910, there were 807 cases pending at the close of June 30, 1911. Penalties were assessed in 254 cases and 66 cases were dismissed. In the preceding fiscal year, of the 438 cases reported, together with those coming over from the preceding fiscal year, 559 were pending at the close of June 30, 1910. Penalties were assessed in 139 cases and 29 cases were dismissed. In the fiscal year 1910, 19 cases were lost, or about 6 per cent of the total number; in the fiscal year 1911, 30 cases were lost, or about 8 per cent of the total. In 1910 penalties in the sum of \$16,500 were recovered, and costs in the sum of \$2,919.35 were paid; in 1911 penalties in the sum of \$26,075 were recovered, and costs in the sum of \$5,783.85 were paid. In short, there were 160 more cases reported in 1911 than in 1910, \$9,575 more in penalties, and \$2,864.50 more in costs collected in 1911 than in 1910, and there were 248 more cases pending on June 30, 1911, than on June 30, 1910.

Two bills are pending before Congress, each providing for an amendment to the twenty-eight-hour law with regard to a minimum speed requirement in the transportation of stock trains. Senate bill No. 5538, introduced by Mr. Lodge on January 19, 1910, provides, in effect, for an average minimum speed of not less than 16 miles per hour on all stock trains operating in interstate commerce, and H. R. No. 11164, introduced in the House of Representatives on June 6, 1911, by Mr. Daniel A. Driscoll, provides, in effect, for an average minimum speed of 15 miles per hour in the case of stock trains. These bills were referred to committee, no further action being taken.

DECISIONS OF THE COURTS.

During the fiscal year 1911, the following important decisions of the Federal courts were handed down in cases arising under the twenty-eight-hour law:

UNITED STATES V. CHICAGO, BURLINGTON & QUINCY RAILROAD CO.

[Circular No. 42, Office of the Solicitor; not reported in the Federal Reporter.]

In answer to a complaint in the usual form the defendant company contended that it was within the exception to the statute in section 3, reading, "*Provided*, That when animals are carried in cars, boats, or other vessels in which they can and do have proper food, water, space, and opportunity to rest, the provisions in regard to their being unloaded shall not apply." In support of this it was shown that those in charge of the train asked the shipper how he was faring, and he answered "all right" and that he could feed and water his stock. No effort, other than this inquiry, was made by the defendant's employees to ascertain whether the animals had food and water. The court overruled this defense, saying that it is not enough to show that animals "can" have food and water, as for instance that the one in charge of them may procure food and water at the stations where stops are made, but it must be shown that the animals "do" have proper food, water, space, and opportunity to rest in the cars, boats, or other vessels where carried.

UNITED STATES V. WABASH RAILROAD CO.

[182 Fed., 802; Circular No. 43, Office of the Solicitor.]

Complaint was made in this case because the court below overruled a demurrer to an answer which asserted that the claim of the United States to recover the statutory penalty from the Wabash Railroad Co. was barred, because the United States had theretofore recovered a penalty from the St. Louis Merchants Bridge Terminal Railway Co., for its receipt from the defendant and subsequent detention of the same

shipment of live stock on which recovery from the Wabash Railroad Co. was predicated. The court held that the cause of action for the penalty under the statute was not so single that but one penalty could be recovered for the confinement of a single shipment beyond the statutory period, although several connecting carriers participated therein, and also held that the contrary of this interpretation, contended for by counsel for the appellee, would violate two familiar rules: First, when the language of a statute is unambiguous, it must be held to mean what it plainly expresses; and second, that where the legislature has created a right of action against a certain class of persons and made no exception, it is not the province of the courts to do so. The judgment below was reversed, as contended for by the Government.

UNITED STATES V. LEHIGH VALLEY RAILROAD CO.

[Circular No. 44, Office of the Solicitor; not reported in the Federal Reporter.]

These cases involved shipments of live stock from points in Michigan or Illinois to Detroit, thence through Canada to Niagara Falls, and thence to points in New York. In each case the cattle were confined in cars for more than 36 hours, without being fed or watered, or unloaded for rest, contrary to the provisions of the act. It was argued, on the part of the defendant companies, that the act had no application to a shipment of live stock passing through a foreign country, en route from one State to another State, and that the statutory period of confinement having expired before the cattle came into the defendant's possession, no liability was incurred until another 28 or 36 hours had passed. The first contention was overruled, the court saying that the shipments were literally within the terms of the act, and also within the spirit. After a review of the opinions in point, citations to which will be found in the decision itself, the court overruled the second contention. The court further held that the question whether a terminal road was liable under the statute for further transportation of stock on which the statutory limit had expired, depended on whether such transportation was a continuance of the original transportation or substantially a part of the process of unloading.

BALTIMORE & OHIO SOUTHWESTERN RAILROAD CO. V. UNITED STATES.

[Supreme Court of the United States, October term, 1910; Circular No. 46, Office of the Solicitor.]

This case included 11 actions instituted against the defendant company in the southern district of Ohio. Most of the shipments were loaded at different times, but because one shipment was forwarded under the 36-hour rule, its unloading time was the same as that of another shipment moving under the 28-hour rule, and loaded 8 hours later at another station; the loading time on two other shipments expired at the same time. The defendant's motion for consolidation was sustained, a writ of error was sued out by the Government, and the circuit court of appeals directed the entry of a separate judgment on each cause of action. The Supreme Court held that the defendant was liable for nine penalties, because nine times it failed to unload the stock, as required by the statute. No distinction, with reference to the number of penalties, the court held, was to be based on the number of shipments confined; the different shipments did not affect the duty of the carrier to the animals, but only the time when the duty to unload was to be performed. The number of consignors, the consent of the owner or agent in charge of the particular shipment that the cattle might be confined 36 hours, the number of bills of lading, and the particulars of the shipment were held to be immaterial, except so far as they served to fix the limit of lawful confinement.

UNITED STATES V. NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO.

[Circular No. 48, Office of the Solicitor; not reported in the Federal Reporter.]

This case involved a shipment of live stock from Chicago, Ill., to New York, N. Y. It was claimed by the United States that the cattle were packed so tightly in some of the cars that they did not have proper space and opportunity to rest, as required by the act. It was in evidence that, in one of the cars, 36 feet long, 21 bulls were loaded side by side, and in a number of them 18 and 19 large cattle were carried. The court found that the stock in these cases did not have sufficient space to lie down, certainly not without danger of being injured by being trampled on by the others. It was probably true, said the court, that they would not all want to lie down at the same time, but to compel cattle to stand for 65 hours continuously under such wearisome conditions as must attend a transportation by rail for such a period of time is clearly a serious form of cruelty. The evidence was uncontradicted that cattle under transportation ought to have at least 2½ feet of space for each animal. That is the space

required in the regulations of the Bureau of Animal Industry in the case of cattle for export. In conclusion, the court held the charge that the cattle did not have proper space and opportunity to rest was established.

UNITED STATES V. NORTHERN PACIFIC TERMINAL CO.

[Circular No. 53, Office of the Solicitor; not reported in the Federal Reporter.]

In this case counsel for the defendant contended that, as the statutory limit had expired when the stock were received by the defendant, and as recovery had been had against the initial carrier on the same shipment, no cause of action could be maintained against the defendant. The court held that a terminal company is not excusable because it accepted and transported stock for a humane purpose, that the purpose of the act is better served if connecting carriers refuse to accept stock on which the time limit had expired. It was held no defense, in an action against a connecting carrier, to say that the initial carrier which had itself violated the law on the same shipment, had been fined therefor.

The most important decision handed down in the past fiscal year in any case arising under the act was the opinion of the Supreme Court, speaking through Mr. Justice Lamar, in *Baltimore & Ohio Southwestern Railroad Co. v. United States* (see Circular No. 46, Office of the Solicitor, *supra*; 220 U. S., 94). The question as to the unit of violation under the statute, decided in this opinion, was raised at an early date, and the position of the Government that the consignment was the unit, and that of the common carriers that the trainload was the unit, were at once assumed. The opinion of the Supreme Court takes a middle ground and makes the number of penalties dependent upon the number of times a carrier fails to comply with the statutory duty to unload, whether the particular group of animals not unloaded be one shipment, or more, or a trainload of stock. The opinion of the Supreme Court is particularly noteworthy because the decision of the circuit court of appeals, when the case was before that bench, has been cited with approval or adopted in the following cases in other districts: *Southern Pacific Co. v. United States*, 171 Fed., 360 (C. C. A.); *United States v. New York, Chicago & St. Louis R. Co.*, 168 Fed., 699; *United States v. Atchison, Topeka & Santa Fe R. Co.*, 166 Fed., 160; *United States v. New York Central & Hudson River R. Co.*, 165 Fed., 833 (C. C. A.); *United States v. Oregon Railway & Navigation Co.*, 163 Fed., 642; *United States v. Southern Pacific Co.*, 157 Fed., 459. Some difficulty has been experienced in applying the rule announced in the decision. It is said in the opinion that "the loading of numerous cars might proceed concurrently; or if not discontinuous or unduly prolonged, several cars of cattle of the same consignor might be loaded at the same time within the meaning of the act, in which event the period of their lawful confinement on the same train would end at the same time and place." The establishment of a definite rule, determining when unloading is discontinuous or unduly prolonged, will have to be worked out through the accumulation of decisions in concrete cases, requiring the application of the principle in the opinion of the Supreme Court.

United States v. St. Louis National Stock Yards Co., involving the liability of a terminal company, in general, under the act, was not argued last term before the Supreme Court, as had been anticipated, but was set for hearing October 10, 1911. Apart from the proposition of law in this case, which the Government believes should be resolved in its favor, the establishment of the liability of terminal companies under the statute will be of considerable value in the enforcement of the act, not merely in the case of other companies of

the same or similar character but as well in the case of the trunk lines. It is plain that the statute contemplates that an individual responsibility should attach, in the course of interstate transportation of live stock, to every carrier accepting a shipment on which the statutory limit has expired. This being so, it is no defense for a connecting or terminal carrier to say that it transported further stock on which the statutory limit had expired, as a matter of humanity, since that was the quickest way to secure food and water for them. In the individual case this may perhaps be true sometimes, but on principle the contention is without merit. This position is well stated by Wolverton, J., in *United States v. Northern Pacific Terminal Co.* (Circular No. 53, Office of the Solicitor, *supra*), where he said:

The enforcement of the law will be better subserved if connecting carriers will refuse to carry any stock that has been confined in cars by a preceding carrier beyond the time limit. Indeed, as I interpret the statute, they violate the law if they do not so refuse. The terminal company could not be made amenable to the State law for prevention of cruelty to animals so long as it did not have charge or was not in possession of the stock. It was not bound to take it from the possession of the Southern Pacific Co. The dilemma was that company's, and none other was called upon to relieve it. Hence I hold that the terminal company rendered itself liable when it assumed possession for the purpose of forwarding the stock on its way to destination.

Holt, J., in *United States v. Lehigh Valley R. R. Co.* (Circular No. 44, Office of the Solicitor, *supra*), points out a distinction which had not theretofore been formulated: "Is the movement substantially a part of the process of unloading or is it a continuance of transportation?" In many cases terminal companies own and use many miles of tracks, and it is certain that delivery to the consignee, as a matter of law, is not made at the moment when the stock are turned over to the terminal company but only when they are actually unloaded. This would seem to bring terminal companies squarely within the ruling in *United States v. Lehigh Valley R. R. Co.*

An important decision of the circuit court of appeals for the eighth circuit, apparently at variance with the basis of an earlier decision, of a lower court, is *United States v. Wabash R. R. Co.*, 182 Fed., 802. In this case the Government recovered, first, from the terminal company, for a confinement of stock on its own line, of less than 28 hours, the initial carrier having confined the stock previously in excess of the statutory period. The lower court held that the Government could not recover, but this ruling was reversed on appeal by the circuit court of appeals for the eighth circuit. In *United States v. Stock Yards Terminal Co.* (Circular No. 26, Office of the Solicitor; Circular No. 33, Office of the Solicitor: 178 Fed., 19), the lower court held that there could be no recovery against the terminal company where the Government had previously recovered from the connecting carrier for detaining the same shipment. While affirming the decision of the court below, it is to be noted that the circuit court of appeals for the eighth circuit sought ground of decision not touched upon in the opinion of the lower court. It has been urged that the position of several connecting carriers each of which violates the law on the same shipment, is analogous to that of joint tortfeasors, and, consequently, that recovery against one bars recovery from any of the others, unless each carrier itself detains the stock on its own line beyond the statutory period. The decision of the circuit court of appeals in the *Wabash* case disposes of this contention in that circuit.

The tendency of the courts to assess larger penalties during the fiscal year 1911 is noteworthy. In the fiscal year 1910 in only 19 cases out of 139 disposed of during the year was the penalty over \$100, the minimum fixed by the act. During the fiscal year 1911, however, in 46 cases out of 254 closed, the penalty was more than \$100. In 1910 the maximum fine assessed was \$400 in 1 case; there were fines of \$300 in 2 cases, \$250 in 8 cases, and \$200 in 8 cases; \$100 was assessed in the rest. In 1911 the maximum fine of \$500 was assessed in 3 cases, \$350 in 1, \$300 in 5, \$250 in 6, \$200 in 17, \$150 in 11 cases, and \$125 in 1 case; \$100 was assessed in the remaining cases. The record of penalties is particularly noteworthy because, owing to the decision of the Supreme Court in *Baltimore & Ohio Southwestern R. R. Co. v. United States*, a number of cases had to be consolidated on which separate penalties would otherwise have probably been secured.

At page 106 of this report will be found a table setting forth the details of cases arising under the 28-hour law (act of June 29, 1906; 34 Stat., 607), and finally disposed of during the period covered by this report.

ACTS REGULATING THE INTERSTATE MOVEMENT OF LIVE STOCK FROM QUARANTINED DISTRICTS AND PROHIBITING THE INTERSTATE MOVEMENT OF DISEASED LIVE STOCK.

The work consisting in the enforcement of the act of Congress approved March 3, 1905 (33 Stat., 1264) entitled, "An act to enable the Secretary of Agriculture to establish and maintain quarantine districts, to permit and regulate the movement of cattle and other live stock therefrom, and for other purposes," and the act of Congress approved May 29, 1884 (23 Stat., 31) entitled, "An act for the establishment of the Bureau of Animal Industry, to prevent the exportation of diseased cattle, and to provide means for the suppression and extirpation of pleuropneumonia and other contagious diseases among domestic animals," have been systematically and unremittingly prosecuted during the past fiscal year.

During the fiscal year ending June 30, 1911, 90 alleged violations of the act of March 3, 1905, and 10 alleged violations of the act of May 29, 1884, were reported to the Attorney General.

In addition to the work and time devoted to examining and collating evidence of alleged violations and reporting the same to the Attorney General, the Office of the Solicitor has continued the practice of keeping in touch with the prosecution of the cases in the United States courts of the various judicial districts, and through the courtesy of the respective United States attorneys has thus been enabled to keep informed as to the status and issue of the proceedings. By reason of special experience in the enforcement of these statutes and long familiarity with the interpretation of their provisions, the Office of the Solicitor has been able to be of material assistance to United States attorneys in questions of law arising in the course of the prosecution of cases thereunder. Rulings and decisions of courts in proceedings in cases that were pertinent or of value in similar cases pending in other districts have been brought promptly to the attention of United States attorneys in such districts. The office has also responded to requests for further investigation or additional evidence in a number of cases.

At the beginning of the fiscal year ending June 30, 1911, cases including 125 alleged violations of the act of March 3, 1905, and 7 alleged violations of the act of May 29, 1884, which had been reported to the Attorney General during that and previous fiscal years, remained pending and undisposed of in the courts; at the end of the fiscal year cases including 190 alleged violations of the act of March 3, 1905, and no cases including alleged violations of the act of May 29, 1884, which had been reported to the Attorney General and in which proceedings had been instituted, remained undisposed of in the courts. These figures include, however, a large number of alleged violations of the act of March 3, 1905, reported to the Attorney General for the most part during the two preceding fiscal years, on the part of certain terminal connecting carriers, in which suits had been withheld but have now been filed and the proceedings continued, awaiting the outcome of a case now pending in the United States Supreme Court, particularly described below.

During the fiscal year cases charging 90 violations of the act of March 3, 1905, and 10 violations of the act of May 29, 1884, respectively, were disposed of in the courts, as against cases including 83 violations of the act of March 3, 1905, and 4 violations of the act of May 29, 1884, disposed of during the fiscal year ending June 30, 1910.

In cases including 51 violations of the act of March 3, 1905, and the act of May 29, 1884, all but 3 of which were charged under the former act, pleas of guilty were entered and fines aggregating \$5,580 were imposed, as compared with aggregate fines of \$2,970 imposed in 24 cases under these acts closed during the fiscal year ending June 30, 1910. This sum is exclusive of costs in each case, which amount to a material addition to the penalties. In three of these cases judgment was suspended, after pleas of guilty entered, on the payment of costs, and in another instance judgment imposing a fine of \$100 and costs was suspended to allow the defendant to apply for remission of the penalty.

Verdicts of not guilty were returned in cases including four violations of the acts of March 3, 1905, and May 29, 1884; proceedings were dismissed in 5, and nolle prosequi was entered in 2 instances; grand juries failed to indict in 18 cases; and the defendant died pending prosecution in 1 case.

The status or disposition of all alleged violations of the act of March 3, 1905, and the act of May 29, 1884, respectively, in which proceedings were instituted or pending during the past fiscal year, is particularly indicated in the table on page 110. The great majority of the violations of the act of March 3, 1905, as may be seen by reference to this table, were on the part of railroad companies, and most of these cases involved the failure of the railroads to comply with the regulation made and promulgated under the act permitting the interstate transportation of cattle and sheep from areas quarantined for certain contagious diseases of live stock to recognized slaughtering centers for immediate slaughter, but requiring that placards of a prescribed size and description be placed and maintained during transit on the cars containing such shipments, and that the waybills and other shipping memoranda pertaining to such shipments be annotated in a prescribed manner, the purpose of this regulation being to insure that such live stock shall be considered and handled as infectious during their interstate transportation through territory where such diseases do not exist. The cars and waybills in such instances, when observed

and examined by inspectors of the Bureau of Animal Industry at these slaughtering centers, in most cases at a great distance from the points of origin of the shipments, are in the hands of connecting or terminal railroads which lie wholly without the quarantined areas and generally after the shipments had been transported by one or more intermediate connecting carriers.

The question of the liability under the act of a railroad company which receives from a connecting carrier and transports live stock wholly outside of the quarantined area was raised by a demurrer interposed by the defendant in a case, *United States v. Southern Railway Co.* (referred to in the table as No. 192), in the district of South Carolina. The court, overruling the demurrer, held that where cattle are transported as a through shipment over two or more connecting railroads from an area of a State quarantined by the Secretary of Agriculture into another State each carrier participating in the transportation of such shipment is liable under the act.

On the other hand, in the similar case, *United States v. Richmond, Fredericksburg & Potomac Railroad Co.*, prosecuted in the eastern district of Virginia, the court sustained a demurrer interposed by the defendant, involving the identical question, on the ground that no prosecution lies against connecting carriers which receive and transport such shipments wholly outside of a quarantined State.

The same question—the liability under the act of a railroad company which receives from connecting carriers and transports live stock wholly outside of the quarantined area—was the ground of an unsuccessful motion in arrest of judgment in the case of *United States v. St. Louis Merchants Bridge Terminal Railway*, charging 5 violations of the act (referred to in the table as Nos. 87, 88, 89, 93, and 94), which was tried in the eastern district of Missouri in December, 1909. A writ of error in the case issuing to the circuit court of appeals for the eighth circuit, that court reversed the judgment of the district court, and in an opinion rendered at the May term, 1911, held that the receipt outside of a quarantined district and subsequent transportation by a railroad company of live stock that was received for transportation and was transported by a previous carrier from a quarantined district in one State into another State is not an offense under the act.

This important and mooted question, however, is now before the United States Supreme Court in the case *United States v. Baltimore & Ohio Southwestern Railroad Co.* In this case an indictment was returned against the defendant railroad company in the southern district of Ohio charging alleged violations of the act of March 3, 1905 (see cases Nos. 281, 282, and 289 in the table), in receiving in the State of Ohio from connecting railroads and transporting, without compliance with the regulations made under the act, shipments of sheep originating in the State of Kentucky, quarantined under the act for scabies in sheep. The indictment was quashed by the court on its own motion, holding that the defendant could not be held to answer the charge, because the indictment showed that the defendant had not received the shipment of sheep in question in the quarantined State of Kentucky and had not transported the same from said quarantined State, but had received said shipments of sheep at a place, and had transported the same through places, wholly and entirely without the quarantined State of Kentucky; and that such facts did not constitute a violation of the act in question. Exception

was thereupon taken by the United States attorney to the ruling and judgment of the court and the case was taken to the United States Supreme Court on writ of error. The case has been advanced on the docket for hearing before that court at the October, 1911, term, and the decision of this important question by the court of the last resort is awaited with great interest.

Awaiting the decision of the Supreme Court in this case, cases including 34 similar violations of the act of March 3, 1905, on the part of the St. Louis Merchants Bridge Terminal Railroad and the Terminal Railroad Association of St. Louis (referred to in the table), pending in the eastern district of Missouri, in which suits have been filed, are being continued. The same situation exists as to proceedings in 110 alleged violations on the part of the St. Louis Merchants Bridge Terminal Railway, the Terminal Railroad Association of St. Louis, and the St. Louis National Stock Yards (also referred to in the table), pending in the eastern district of Illinois. Judgment was suspended for the same reason in two cases against the Louisville & Nashville Railroad Co. prosecuted in the northern district of Alabama, in which pleas of guilty were entered and fines imposed.

A table setting forth the details of cases arising under the acts of May 29, 1884, and March 3, 1905, acted upon in the fiscal year 1911, will be found at page 110 of this report.

THE MEAT INSPECTION AMENDMENT.

During the fiscal year 1911, there were reported to the Attorney General 101 violations of the meat inspection amendment of June 30, 1906 (34 Stat., 674), while during the fiscal year 1910, 52 such violations were similarly reported, making an increase of 49 violations in 1911. Of the 101 cases reported during the year, together with those coming over from previous years, 46 resulted in convictions, 8 were dismissed for various reasons, in 4 cases the grand jury failed to return indictments, and in 1 case a verdict was rendered for the defendant. At the close of the year 74 cases were pending. The total fines assessed during the year amounted to \$3,240, as compared with \$2,397 in fines assessed in 1910. At page 121 of the report will be found a table setting forth the details of cases arising under the meat inspection amendment.

As explained in the report of this office for the fiscal year 1910 three cases were pending in the Federal court at Pittsburgh, Pa., at the close of June 30, 1910, involving important questions in connection with the meat inspection amendment (act of June 30, 1906; 34 Stat., 674). These suits were entitled *Pittsburg Melting Co. v. Pennsylvania R. R. Co.*; *United States v. Pittsburg Melting Co.* and *William H. Womsley*; and *Pittsburg Melting Co. v. Baltimore & Ohio R. R. Co.* and *G. E. Totten*, inspector of the Bureau of Animal Industry, Department of Agriculture.

In the first case a bill in equity was filed by the Pittsburg Melting Co. seeking to compel the defendant carrier to accept for transportation and transport in interstate commerce oleo oil which had not been inspected, passed, and so marked by agents of the Department of Agriculture, as required by the meat inspection amendment. The bill alleged that the statute was unconstitutional as beyond the power of Congress to enact, and in violation of the fifth amendment; it was further claimed that the system of inspection provided for in

the act did not relate to interstate commerce. The second proceeding was a criminal prosecution instituted against the Pittsburg Melting Co. and Wm. H. Womsley, its president, based on the delivery to the Baltimore & Ohio Railroad Co. at Pittsburgh, for shipment in interstate or foreign commerce, of an uninspected meat food product, to wit, oleo oil, in violation of the provisions of the meat inspection amendment. Having been formally notified of existing conditions and of the contentions of the Government, the Baltimore & Ohio Railroad Co. declined to receive further consignments of uninspected meat food products from the Pittsburg Melting Co. for transportation in interstate or foreign commerce, whereupon the Pittsburg Melting Co. filed a bill in equity against the Baltimore & Ohio Railroad Co. similar in form to that filed against the Pennsylvania Railroad Co., praying that an injunction issue to compel the Baltimore & Ohio Railroad Co. to receive their products for shipment in interstate and foreign commerce, and to restrain G. E. Totten, inspector of the Bureau of Animal Industry of the Department of Agriculture stationed at Pittsburgh, from molesting, interfering with, or taking any action detrimental to the interests of the company pending the decision in the case. Hearing on the injunction was held in the United States District Court for the Western District of Pennsylvania, and, as a result, the temporary injunction issued as prayed. A demurrer was filed to the indictment against the Pittsburg Melting Co. and Wm. H. Womsley, attacking the constitutionality of the act upon an alleged violation of which the prosecution has been instituted. The demurrer was finally overruled by the court and the defendants placed on trial, which resulted in their acquittal, the court holding that no violation of the statute had been made out and ordering that a verdict of not guilty be entered.

The constitutionality of the act having been sustained by the court in overruling the demurrer in the case against the Pittsburg Melting Co. and William H. Womsley, counsel for the company requested leave of court to withdraw the proceeding in the case of Pittsburg Melting Co. *v.* Pennsylvania Railroad Co. and to discontinue the case of Pittsburg Melting Co. *v.* Baltimore & Ohio Railroad Co. and G. E. Totten, inspector of the Bureau of Animal Industry, Department of Agriculture. Both motions were granted by the court, it being ordered that the temporary injunction granted in case of Pittsburg Melting Co. *v.* Baltimore & Ohio Railroad Co. and G. E. Totten be dissolved. The decision on demurrer in *United States v. Pittsburg Melting Co. and William H. Womsley* is noteworthy, since it represents the only contested case thus far in which the constitutionality of the act was drawn in question and sustained.

THE LACEY ACT.

During the period covered by this report 4 cases arising under sections 242 and 243 of the Criminal Code of the United States (35 Stat., 1088) were reported to the Attorney General for appropriate action. Two of these cases were subsequently dismissed, owing to the fact service could not be obtained upon the defendants; the other two cases were pending at the close of June 30, 1911 (Department of Agriculture Miscellaneous Cases Nos. 121 and 122). The case of 23 Japanese poachers who were arrested on Laysan Island in the act of killing birds was brought to trial and the defendants fined and imprisoned.

INSECTICIDE ACT OF 1910.

The insecticide act of 1910 was approved April 26, 1910, and became effective January 1, 1911 (36 Stat., 331). It deals with insecticides, fungicides, lead arsenates, and paris greens which are adulterated or misbranded and which are shipped in interstate commerce. By its provisions the Secretary of the Treasury, the Secretary of Agriculture, and the Secretary of Commerce and Labor are authorized to make uniform rules and regulations for its enforcement. On December 9, 1910, the three Secretaries promulgated rules and regulations, which are issued as Circular 34 of the Office of the Secretary. The appropriation for the enforcement of the act during the fiscal year ending June 30, 1911, was not made until March 4, 1911.

Several formal and informal opinions on the construction of the sections of the statute have been rendered. The general guaranties filed under section 9 of the act have been examined, and there has been much correspondence with wholesalers, jobbers, and dealers in regard to the various provisions of the act.

LEGAL WORK FOR THE FOREST SERVICE.

In the previous annual report of this office an outline of the duties of the Solicitor in respect to the Forest Service legal work is very fully stated. At the time that that report was submitted the Solicitor had had immediate supervision of the legal work of the Forest Service but six months, a time sufficiently long, however, to admit of a complete reorganization of the office for the effective discharge of the duties incident to this work. By the end of the preceding fiscal year the work, both in Washington and in the six districts, was progressing smoothly and expeditiously.

The work of the office for the Forest Service comprehends several sharply defined and distinct divisions, each in itself imposing upon the office a very considerable volume of business. These divisions are opinions, contracts, claims, regulations, trespass, general litigation, and hydroelectric power permits. The subject trespass naturally resolves itself into four distinct subdivisions, namely, grazing, timber, fire, and occupancy, which latter very generally comprehends all trespasses not included in the first three heads. A general view of the duties of this office in respect to each one of the above-stated divisions of its work was given in the last annual report, and will not be repeated.

The report for this branch of the work of the office will be arranged under the proper heading, as above indicated.

OPINIONS.

The Solicitor has been called upon during the present fiscal year for 56 opinions, which required, in much the larger number of them, extended consideration and research. These opinions were given in written memoranda or letters to the Forester. In addition to these practically daily oral advice has been given the Forester and his assistants. The district assistants to the Solicitor have rendered to the respective district foresters and district fiscal agents 86 formal opinions, in which the subjects therein treated were exhaustively examined. These opinions were subsequently forwarded to the Solicitor for review and proper action. They also rendered 857

informal opinions embraced in informal memoranda, copies of which were not sent to the Solicitor, except in a very few cases where the Solicitor was satisfied, from the report of the opinion in the weekly report of the district assistant, that the opinion needed revision. In addition to the rendition of these opinions the district assistants to the Solicitor have each submitted to the Solicitor full comment on the opinions rendered by the assistants in all the other districts. Many of these comments embrace extensive considerations of the questions involved in the opinions commented upon and serve as an aid to the Solicitor in rendering his final decision upon the opinion. Daily oral advice was given by the district assistants of this office to the district foresters and the district fiscal agents and their assistants.

The Solicitor has rendered during the year 116 decisions on opinions of his district assistants. It is a gratification to report that whenever it has been deemed advisable to submit a question embraced in a decision of this office in regard to the administration of the national forests to the Attorney General or the Comptroller of the Treasury, the decision of this office has always been sustained.

CONTRACTS.

Several contracts with State authorities and individuals for cooperative work in forest investigations and improvement were drafted or examined during the year. In addition, there were prepared or examined 423 contracts for miscellaneous purposes, and 196 leases of administrative quarters, and 207 bonds were either prepared or examined by the Solicitor and his district assistants.

Near the close of the year the Solicitor prepared the contract with Andrew and N. W. Gennett for conveyance to the United States of 32,000 acres of land in northern Georgia, this land lying at the headwaters of several important navigable streams, and its purchase by the Government authorized by the act of March 1, 1911, commonly known as the Weeks forestry law. Several forms have been drafted for printing by the department in connection with the administration of the National Forests, among them stipulations to be required of railroad companies when applying for rights of way over lands in the National Forests and contracts with the States for cooperation in fire protection on areas lying on the watersheds of navigable streams, under the terms of section 2 of the act of March 1, 1911, above referred to.

CLAIMS.

This office has handled during the year 2,331 cases involving claims to lands within the National Forests, an explanatory table of which is given on page 133. Not all of these cases came on for hearing during the year, but each one required some attention, varying in degree with the progress of the case in the Interior Department. Each one of these cases involves, on an average, 120 acres of land, and it is therefore apparent that the entire area involved was very great. In the last annual report of this office a detailed statement was made of the procedure in claims cases. It is sufficient to say at this time that this procedure entails upon this office a very large volume of work. The district assistants to the Solicitor are required to cooperate to the fullest extent with the chiefs of

field division and special agents of the General Land Office in handling these cases and, as a consequence of the standing secured to this office by the joint order of yourself and the Secretary of the Interior of June 25, 1910, in regard to claims to lands in the National Forests, are very frequently required to take action independently of the field officers of the General Land Office. It is gratifying to report that the cooperation between the two departments has not only been productive of splendid results, but has also been most cordial. During the year 662 cases have been decided in favor of the Government. These involved approximately 100,404 acres of land, supporting 416,234,797 board measure feet of timber, valued at \$805,270. Cases decided in favor of claimants number 222, or one-third of the number decided in favor of the Government. These involved approximately 30,000 acres of land, supporting approximately 100,000,000 board measure feet of timber, valued at \$250,000.

Under the joint order of the Secretary of Agriculture and the Secretary of the Interior above referred to, the assistants to the Solicitor are accorded the right of appearing at the hearings in every claims case involving lands in the National Forests for the purpose of participating in the production and examination of witnesses. In a number of cases the hearings have been conducted entirely by the assistants to the Solicitor. These assistants have attended 352 hearings during the year and have prepared several sets of questions to be propounded to witnesses residing in jurisdictions beyond those where hearings were held. It is the practice of the district assistants to the Solicitor, as soon after a hearing as possible, to prepare and file with the register and receiver a brief in behalf of the Government. This practice has been somewhat novel in procedure in claims cases before registers and receivers in that, prior to June 25, 1910, it was rarely the practice of the special agents of the General Land Office to file briefs or argue cases in the local land offices. I am satisfied that filing these briefs for the consideration of registers and receivers has had a most beneficial effect, since the briefs very frequently present to them phases of the cases which are easily overlooked by an officer examining testimony. The district assistants filed during the year 150 briefs in the local land offices. These briefs not only serve as arguments before the registers and receivers but are also transmitted with the records of the cases to the Commissioner of the General Land Office and are again considered. When the commissioner has rendered his decision, and it appears to the Solicitor that an appeal should be taken in behalf of the Government, if the decision is adverse to it, or that a brief should be filed with the Secretary of the Interior, if the decision is favorable to the Government and an appeal is taken by the claimant, a petition for review accompanied with the brief is prepared and filed by the Solicitor in the former case, and a brief prepared and filed by him in the latter case. The Solicitor has prepared and filed 69 briefs during the fiscal year, and one of his assistants appeared in oral argument before the Secretary of the Interior in one case.

Under the joint order of June 25, 1910, heretofore referred to, it was the practice of the department to refer all adverse reports of the Forest Service on claims to lands in the national forests to the Secretary of Agriculture. The adverse reports made by district foresters

were submitted to the Forester for his consideration and recommendation and were then referred to the Solicitor for consideration of the legal aspects of the cases, who prepared a report to the Secretary of Agriculture recommending for or against adverse proceedings.

The Solicitor examined during the year 163 reports of the Forest Service and made recommendations to the Secretary of Agriculture in them, in 74 of which no adverse proceedings were recommended and in 89 of which such proceedings were recommended.

Although the practice of referring to the Secretary of Agriculture adverse reports of the Forest Service had a most salutary effect upon the character of the reports and operated satisfactorily, it was, nevertheless, found that time could be saved both the Government and claimants if adverse reports of the Forest Service could be given a more direct route to the Commissioner of the General Land Office, and it was therefore thought advisable to make an investigation of the probable operation of a change of practice which would permit the district foresters to submit these reports direct to the chiefs of field division to be transmitted by them direct to the Commissioner of the General Land Office, thus obviating the necessity of sending the reports to Washington for consideration of the Forester, the Solicitor, and the Secretary of Agriculture. Accordingly arrangements were made by the Forest Service, the General Land Office, and the Solicitor for a committee to investigate this matter during the fall of 1910, there being also several other matters connected with claims litigation to be settled between the three offices above named.

In furtherance of these purposes the chief of field service in the General Land Office, the general inspector of the Forest Service, and my assistant in charge of the Forest Service legal work left Washington on August 18, 1910, for conferences with the chiefs of field division, the district foresters, and district assistants to the Solicitor in the six districts. The chief purpose of this committee was to go over carefully with these officers the joint order of June 25, 1910, for the purpose of explaining the order and securing a uniform practice thereunder in the public-land States. While in conference in the several districts many suggestions were made and received in regard to a reform of the joint order of June 25, 1910, in respect to the handling of adverse reports, and when the committee returned to Washington it recommended that the adverse reports thereafter be referred direct by the district foresters to the chiefs of field division for submission to the Commissioner of the General Land Office. The recommendation was adopted, and on November 25, 1910, the Secretary of Agriculture and the Secretary of the Interior promulgated another joint order amendatory of that of June 25, 1910. This order has operated beneficially and satisfactorily in every respect.

At page 133 of this report will be found a table showing the details of claims cases pending, acted upon, or closed during the fiscal year 1911. These cases are arranged according to the districts in which they arose.

REGULATIONS.

For the past three years the regulations for the administration of the National Forests have been in process of revision by the Forest Service. In the fall of 1910, during the fiscal year, there were submitted to me for examination the regulations relating to the occupancy

of lands in the National Forests for purposes connected with the generation and distribution of hydro-electric power. The former regulations relating to this branch of the administration of the National Forests were meager and did not cover the entire field, as was developed by experience in their enforcement. The new regulations were therefore much more numerous and comprehensive and were the result of several years' investigation by the Service, in which the opinions and views of many engineers and producers of hydro-electric power were sought. These regulations were the subject of very careful scrutiny by this office, and numerous conferences were held with the Forester and his assistants in regard to modifications or amplifications of certain of them. They were finally completed, together with the instructions to forest officers and those intending to apply for permits thereunder, in December, 1910, and were promulgated by the Secretary of Agriculture on the 29th of that month. Immediately succeeding the promulgation of these regulations those for the control and regulation of grazing on the National Forests were submitted to this office for attention. The grazing regulations were likewise intended to be very much more comprehensive and explicit than those heretofore existing. In the course of the examination of the regulations in this office numerous conferences were had with the Forester and his assistants and the regulations were finally submitted to the Secretary of Agriculture during March of the current year and received his approval on the 18th of that month. Experience in administration of the grazing privileges on the National Forests had developed that some logical and systematic means should be provided for frequent appeals from decisions of the various forest officers to the officer next higher in rank, and new regulations and instructions thereunder were made to secure the right to an appeal and to provide an orderly method of invoking the right.

Special uses of lands in the National Forests next received the attention of this office, and the regulations and instructions thereunder submitted by the Forest Service were examined and finally perfected during March and received the approval of the Secretary of Agriculture on the 18th of that month. A procedure for appeals was also fully provided for in these regulations. Those parts of the proposed National Forest code relating to trespass and timber sales were finished during the fiscal year and were ready for submission at its close. The settlement and claims parts of the code received considerable attention during the fiscal year and were very nearly completed at its close.

It is believed that these regulations now rest upon a solid and substantial foundation and will in every respect meet the requirements of an orderly and businesslike administration of the National Forests.

TRESPASS.

The year has witnessed marked activity on the part of forest officers in ascertaining and reporting trespasses on the National Forests. Of the various kinds of trespasses committed on the Forests none can equal in disastrous consequences those embraced in the heading "Fire trespasses." This was forcibly illustrated by the forest fires which swept the Northwest in the first half of the fiscal year, and not

only extinguished many human lives and destroyed large private interests but also consumed millions of feet of valuable timber and damaged large areas along the watersheds of important navigable streams. Especial attention was therefore given by the Forest Service to this class of trespasses during the year, which resulted in the apprehension and conviction of several offenders, as will be more fully shown under the appropriate heading.

GRAZING.—One of the most difficult problems confronting the Forest Service since the establishment of the forest reservation policy has been the prevention of trespasses by stockmen. So accustomed to graze their animals on the public lands in the West without hindrance, a considerable number of them have been loath to recognize the restrictions upon grazing in the National Forests and have contended that there was no authority in the Secretary of Agriculture to require them to take out permits and observe the regulations of the department. Yet others, recognizing the benefits attending a fair and businesslike apportionment of the range, have gladly acquiesced in the policy followed by the department. As a result of the determination of some stockmen to graze the Forests despite the prohibitive regulations, it was necessary during the year to report to the Attorney General 24 cases for criminal prosecution and 12 for injunction suits. Of the criminal cases determined during the year 11 resulted in convictions, for which \$800 were imposed as fines. Injunctions were granted in 8 of the 12 cases. Under the procedure for handling those trespasses committed without criminal intent and knowledge, 86 cases were examined in this office and full reports made to you thereon, with recommendations for administrative settlement. Your letters to the trespassers, prepared in this office, demanding the value of forest products destroyed or taken have usually met with speedy remittance in full. There have been 55 remittances during the year, aggregating \$2,000.04. The remaining cases will undoubtedly be settled in the coming year. Whenever the reports of the Forest officers disclose that a trespass was committed knowingly and willfully the case is reported to the Attorney General for civil suit to enforce payment not only of actual but also of exemplary damages. There were so reported during the year 35 cases, in 13 of which recoveries have been had of \$2,094.57 actual and \$817 exemplary damages. Outstanding judgments amount to \$317.50. An inspection of the tables (p. 129) will show that in several cases the exemplary damages were greatly in excess of the actual, leaving the trespasser no profit in his venture, and serving as an effective check upon further trespasses by him and as a warning to others so disposed.

The tables at page 129 are intended to show the more important details of the grazing trespasses handled during the year. Aside from this, the district assistants to the Solicitor have rendered service in connection with numerous reports of forest officers which were found insufficient from legal considerations for administrative or judicial action.

TIMBER.—Litigation growing out of timber trespasses has occupied a large part of the time of this office during the year. Two notable cases, which had been pending for some years in an effort to secure sufficient testimony to sustain the Government's entire demand,

received special attention during the year. These cases involve very extensive and long-continued trespasses by the Carbon Timber Co., in Wyoming, and John C. Teller and the Union Pacific Railroad Co., in Colorado. Suit in the former case was instituted during the year, and the latter had been pending for two years. As a result of negotiations with the defendants, very satisfactory compromises were effected by the departments interested. The Carbon Timber Co. trespass was closed by an agreement wherein the company bound itself, under adequate bond, to pay the Government \$23,572.24, and to expend \$20,000 in the construction of a fire line around the cut-over area, this line to be in every respect satisfactory to this department. The Teller trespass involved the cutting of large quantities of railroad ties, which were sold to the Union Pacific Railroad Co., and was settled by payment to the Government of \$27,440.

There were 9 cases reported to the Attorney General for criminal prosecution during the year, 5 of which resulted in convictions, and only 1 in acquittal. Defendants were sentenced to terms in jail in 3 of the cases. In 27 of the cases reported to the Attorney General for institution of civil suits settlements and judgments were secured in 13, resulting in the collection of \$44,427.83. In the 4 cases settled by this department the Government secured \$20,388.87, the value of the timber appropriated. Injunctions were asked in 4 cases and secured in 1, and the other 3 cases were pending at the close of the year.

Interesting questions have arisen in connection with some of these trespasses, such, for example, as the claim of the Bonner's Ferry Lumber Co. that it was not liable to the United States for timber cut upon unsurveyed sections of land lying in National Forests and embraced within what is known as school sections, being sections 16 and 36 in each township, which were granted by Congress to certain States for support of public schools. The Government's demurrer to the defendant's plea setting up the above defense was sustained by Judge Dietrich, of the district of Idaho, in December of the fiscal year. In the opinion rendered (*United States v. Bonner's Ferry Lumber Co.*, 184 Fed., 187) it was held:

Idaho admission act July 3, 1890, c. 656, § 4, 26 Stat., 215, reserved to the State sections 16 and 36 of every township, or other contiguous land in lieu thereof, for school purposes; and section 5 declared that all such lands should be disposed of at public sale, etc., should constitute a part of the permanent school fund, and otherwise regulated its disposition. Held, that prior to an official survey, the title to land which, when surveyed, would constitute school sections in the several townships, remained in the United States; and hence, prior to such survey, the State could not grant any authority to remove timber therefrom, nor prevent the United States from recovering the value of timber so removed.

In another case, which is still pending in the district of Idaho, the Milwaukee Lumber Co. was enjoined during the year from cutting fire-killed timber standing on unclassified lands within the primary limits of the grant to the Northern Pacific Railroad Co. and within the Coeur d'Alene National Forest. The department assented to a suspension of the temporary injunction pending final determination of the issues involved, upon the company's filing a sufficient bond to pay the value of the timber in the event the Government should prevail in the suit.

In July of the fiscal year the department reported to the Attorney General facts disclosing a civil timber trespass by G. D. Gorus on the Bitterroot National Forest in Montana, and in the letter reporting

the case requested institution of suit to recover the value of the timber after it was cut at the place where it was cut. In his reply, acknowledging receipt of the report, and your letter requesting suit, the Attorney General advised that he would instruct the United States attorney to institute suit for the stumpage value of the timber—that is, the value of the timber as it stood at the time of the trespass. This value was materially less than the basis of value recommended by the department. The Attorney General advised that this instruction would be given to the United States attorney in consonance with the decision of the Supreme Court of the United States in the *Woodenware* case (106 U. S., 432). This gave rise in this office to a very thorough review of the decisions of the courts touching the measure of value for timber innocently cut by trespassers. In the opinion of the Solicitor, after a thorough canvass of the decisions, the proper measure of damages in such cases was that announced by the Supreme Court in the case of the *United States v. St. Anthony Railroad Co.* (192 U. S., 524), where it was distinctly held that the measure should be the value of the timber after it was cut at the place where it was cut, no deduction in behalf of the defendant being made for labor bestowed in felling the timber. A letter was therefore prepared to the Attorney General presenting this view. The Secretary of Agriculture was duly advised by the Attorney General that he had carefully examined, not only the decisions of the Supreme Court, but also the decisions of other courts, and had concluded that the measure of damages in such cases as this was as stated in your letter reporting the *Gorus* case to him. He therefore advised that the United States attorney would be instructed to institute suit to recover the value of the timber after it was cut at the place where it was cut. Prior to this the Government had brought suit in innocent timber trespass cases for the value of timber on the stump.

At page 123 of this report will be found a table setting forth the details of the cases involving timber trespasses handled by the department during the fiscal year 1911.

FIRE.—The disastrous consequences of the forest fires which swept the Northwest during the summer and fall of 1910 are still fresh in the memories of all who followed the accounts of the suffering and hardships entailed thereby. That many of the fires were of incendiary origin was beyond doubt, and the Forest Service, therefore, early initiated and prosecuted a vigorous investigation to ascertain the offenders. During September arrangements were made with the Department of Justice for the detail of several agents of its Bureau of Investigation to ascertain the origin of the fires, particularly in Oregon and Washington. The Attorney General directed five of the agents of his department to report to the district forester in Portland for conference with him. With the assistance of such information as the district forester was enabled to furnish these agents early entered upon their field duties. As a consequence, several parties were apprehended, prosecuted, and convicted. So meager was the information that a number of offenders necessarily escaped. Some of these were subsequently discovered by the forest officers and prosecutions were instituted.

There were reported to the Attorney General during the year for criminal prosecution 35 cases, in 8 of which convictions were secured,

upon which \$333.50 were imposed as fines. In 4 cases the defendants were committed to jail and in 1 sentence was suspended. Only 2 defendants were acquitted. The remaining cases were pending at the close of the year. There were 25 cases prosecuted in the State courts, resulting in 20 convictions and fines aggregating \$375 and 5 jail sentences. Only 3 defendants were acquitted. Aside from the foregoing there were several suits instituted against corporations and individuals for recovery of the value of timber destroyed by fires negligently communicated by them to timber on the national forests. In 4 of the 8 cases so handled the Government recovered \$20,333.78, and it is worthy of special note that in one, *United States v. Bailey*, receiver for the Missouri River & Northwestern Railroad Co., the Government recovered, in addition to the value of matured timber, \$1,094.40 as damages to young growth destroyed, the measure of such damages being the cost of replanting the burned-over area and caring for it until the saplings should reach the age of the young trees burned.

The department settled 4 innocent fire trespass cases by the exaction of \$613.42, the value of the timber destroyed.

It will be seen that 25 cases were prosecuted in the State courts. This course has been pursued by the department whenever more expeditious and certain action could be secured than by awaiting sessions of Federal grand juries. The table on page 123 will show what excellent results attended this policy. In all these cases the district assistants to the Solicitor cooperated fully with State authorities and appeared at the hearings and trials to participate therein.

Section 52 of the Criminal Code of the United States provides that whoever shall willfully set on fire, or cause to be set on fire, any timber, undergrowth, or grass upon the public domain shall be fined not more than \$5,000 or imprisoned not more than two years, or both. In the case of the *United States v. Henry Clay*, which resulted in the defendant's conviction during the fiscal year, in the southern district of California, it was contended in behalf of the defendant that as the fire was set on private land there was no liability under the above-stated section of the Criminal Code. Judge Wellborn, however, instructed the jury as follows:

You are further charged that it is immaterial whether the fire mentioned in this indictment originated on private land if it was set willfully and if in the course of nature and in view of all the surroundings the said fire would reasonably be expected to be communicated to the public domain. A man has no lawful right to set fire to his own property if he has reason to believe or intends that such fire will be communicated to the property of others and destroy it.

At page 123 of this report will be found a table setting forth the details of the cases considered under the foregoing heading.

OCCUPANCY.—As heretofore stated, all trespasses which do not naturally fall under the headings grazing, fire, and timber, are assembled under the designation "Occupancy trespasses," which, in this report, embrace illegal use of unperfected mining claims for conduct of saloons thereon; possession of land under claim of right adverse to the United States; possession of land for water-power development without permit from this department; acquisition of patent to land through illegal means; and unlawful inclosure of lands.

The prosecutions of several defendants for maintaining saloons on unperfected mining locations in violation of the regulations of this

department which were begun in the last fiscal year were terminated in the present. The defendants in these cases were all convicted and sentenced to pay fines ranging from \$5 to \$195. Pleas of guilty were very promptly entered by some of the defendants after the decision of Judge Dietrich in the case of the United States *v.* Rizzinelli et al. (182 Fed., 675), decided August 24, 1910. In this decision it was held that the act of June 4, 1897, authorizing the Secretary of Agriculture to make regulations for the occupancy and use of lands within the National Forests is constitutional; that a regulation of the Secretary of Agriculture prohibiting the erection and maintenance of a saloon on an unperfected mining claim within a National Forest is valid; and that one who locates lands within the National Forests under the mining laws has no right to maintain thereon a saloon in violation of the regulation prohibiting it. Broadly, it was decided that lands in the National Forests, entered under the public land laws, can not be used for purposes inconsistent with those for which the entry, location, or appropriation was made, at least prior to the perfection of title in the occupant. Accordingly, the demurrers of these defendants to the indictments were overruled. In the preparation and presentation of this case to the court my assistant at Missoula, Mont., prepared and filed a very exhaustive and elaborate brief and made the oral argument at the hearing on the demurrers. The importance of this decision can not be overestimated, and it has had the effect of placing the administration of the National Forests upon a more effective basis. There are now pending in Nevada several indictments against parties for maintaining saloons on mining claims in National Forests. Several of these parties have not yet been apprehended and all the cases were pending at the close of the year.

Several cases reported to the Attorney General during the year were based upon the occupancy of land in the National Forests under claims of right adverse to the United States, such, for example, as rights asserted under unapproved selections by States and railroads, made in lieu of lands lost to them by reason of their inclusion in reservations. In one case, a former permittee of this department, who had erected a house on land in the Olympic National Forest, refused to vacate the land, asserting vested rights therein, and it became necessary to institute an action of ejectment to recover possession of the land. Judgment of ouster was rendered and the possession restored to the Government. This is the only case under this heading decided during the year. The others were pending at its close.

In one of the suits, the facts in which were reported to the Attorney General during the preceding fiscal year, to terminate unlawful occupancy of lands in the Montezuma National Forest, in connection with the development of hydroelectric power, a temporary injunction was granted by the court during the fiscal year. Six other cases of a similar nature were reported to the Attorney General during the year, in one of which a temporary injunction was granted by the court. This is the case of the Hydro-Electric Co. of California, which, without permit from the Secretary of Agriculture, had constructed several hundred feet of its ditch over lands in the Mono National Forest, Cal., when application was made by the Government for an injunction. The company asserted and still asserts a right to cross the

lands in the Forest without permission from this department, on the ground that the land so traversed by its ditch is covered with mining locations owned by the company at the time the ditch was constructed. This is a novel issue, and its decision will be awaited with interest.

Ten cases are now pending in which the Government seeks cancellation of patents to lands which were secured illegally. These suits were either reported or instituted during the year at the request of this department. Two of these cases have resulted in the cancellation of patents and restoration of the land to the National Forest. One of them amounts, in fact, to 97 suits for cancellation of that many patents secured under the timber and stone act, and involve 15,428 acres of timber land.

One case was pending at the close of the year involving the unlawful inclosure of lands in the National Forest.

In all of the foregoing cases the district assistants to the Solicitor have rendered assistance to the United States attorneys, both in preparing the necessary pleadings and answers and in working up the evidence to support the Government's case.

At page 125 of this report will be found a table setting forth the details of the cases designated as occupancy trespass cases.

GENERAL LITIGATION

Under this heading fall all those cases which are not embraced within the general designation "trespass." During the year 2 parties were convicted and each sentenced to 90 days in jail for theft of property of the United States on the Pocatello National Forest, Idaho, and another was bound over for action by the grand jury on a charge of larceny of property of the department in the Portland office of the Forest Service. Another party was convicted and fined \$100 and sentenced to jail for 90 days for forgery of an indorsement on a check issued by this department. During the early part of the fiscal year advices were received by the Forest Service that one D. A. Grimes was engaged in soliciting orders for hardy catalpa trees from residents and citizens of Iowa on the representation that he was an agent of the Forest Service for the introduction of these trees into that State. Grimes was not and never had been connected in any way with this department, and the Attorney General was requested to institute a prosecution for the offense. Grimes was brought to trial in the northern district of Iowa in June of the fiscal year and was convicted and fined \$25.

A very important case now pending in the eastern district of Washington involves the question of the right of the Government to use waters flowing in a stream past a ranger station for the purpose of irrigating part of the land included in the station. During the year an appropriator of the water in this stream, under the laws of the State of Washington, applied for an injunction in a State court to restrain the forest officer in charge of the ranger station from using water from this stream for the above stated purpose. A temporary injunction was granted by the State court, and the Secretary of Agriculture requested the Attorney General to institute an action in the Federal court to restrain the plaintiff in the State court from

interfering with the use of the water by the forest officer. The bill applying for the injunction was filed near the close of the year.

The district assistants to the Solicitor have cooperated fully with the United States attorneys in the preparation and prosecution of the above-stated cases.

At page 127 of this report will be found a table setting forth the details of cases designated as general litigation under the foregoing heading.

LEGISLATION.

As a result of the extensive forest fires in the Northwest during the first half of the fiscal year, large bodies of timber were killed, though still left in a merchantable state. Much of this timber stands on lands embraced within unperfected entries and locations under the public land laws, and within unapproved selections by States and railroads made in lieu of granted lands lost by reason of their inclusion in reservations. As the law exists there is no authority in these entrymen, locators, and selectors to cut the timber from the lands, nor has the department authority to sell the timber. Large quantities of timber standing on unreserved public lands was also killed by these forest fires, but the Interior Department felt that it had no authority to sell the timber. As this fire-killed timber would rapidly deteriorate it was the desire of both departments that authority be secured from Congress for early disposition of the timber. Accordingly, the Forester and the Solicitor of this department met with representatives of the Interior Department and jointly framed a bill intended to authorize the utilization of this fire-killed timber. The bill was introduced in the Senate and passed with some amendments and was afterwards amended and passed by the House, but the session ended without further action and the measure did not become a law.

It has been the complaint of individuals and corporations desiring to utilize lands in the National Forests and in the unreserved public domain, for the purpose of generating hydroelectric power, that the statutes of the United States regulating the use and occupation of such lands for this purpose were so unsatisfactory in the matter of tenure that it was practically impossible to secure loans which would make development practicable. It was objected that the permits issued both by the Interior department and this department were revocable in the discretion of the Government. In order to remedy this situation and make permits granted by the Government more stable in character, the Forester and Solicitor of this department had several conferences with representatives of the Interior Department in an effort to draft a bill which would adequately protect the Government and at the same time allow private enterprise sufficient security in the matter of tenure to encourage development of power possibilities on Government lands. A bill was prepared after much deliberation, and was introduced in Congress, but never came up for passage.

During the year several bills, either introduced in Congress or proposed to be introduced, were submitted to the Solicitor for examination and recommendation. These all received careful consideration and, wherever necessary, recommendations were made.

HYDROELECTRIC POWER PERMITS.

During the year there was submitted to the Solicitor, for examination, 45 applications for permits under the act of February 15, 1901, which provides that the Secretary of Agriculture may, in his discretion, allow the use of rights of way in the National Forests for the generation and utilization of hydroelectric power. A careful scrutiny of all these applications has been made by this office and reports submitted to you thereon. In addition to this there have been several contests between opposing applicants for rights of way over the same lands which have resulted in hearings before the Solicitor for report to you.

DECISIONS OF THE COURTS.

As of first importance under this heading should be mentioned the decisions of the Supreme Court of the United States handed down on May 1, 1911, in the cases known as the *United States v. Fred Light* and *United States v. Grimaud, Carajous, and Inda*. (220 U. S., 523; *Id.*, 506.)

The case of *United States v. Fred Light* was an action by the United States to restrain Light from pasturing stock upon the Holy Cross National Forest, Colo., without a permit from the Secretary of Agriculture. Light defended on the ground that the laws of Colorado make it indispensable to the maintenance of such an action that the owner of land must fence it against trespassing stock, and that the act of June 4, 1897, is unconstitutional, because it delegates legislative authority to the Secretary of Agriculture to make and define a crime, and that the act of March 3, 1891, authorizing the President to set aside public lands as national forests, is also unconstitutional and can not authorize the creation of forests without the consent of the State in which the lands are situated. The substance of the decision of the Supreme Court is as follows:

1. The United States can prohibit absolutely or fix the terms on which its property may be used and can withhold or reserve the land indefinitely, and this, without the consent of the State in which it is situated.
2. The long-continued sufferance by the United States of the pasturing of cattle on the public lands did not confer upon anyone a vested right to the use of those lands for that purpose; nor could it deprive the United States of the power of recalling the implied license arising therefrom so to do.
3. The Government has, with respect to its own lands, the rights of an ordinary proprietor to maintain its possession and prosecute trespassers, and it may deal with such lands precisely as an ordinary individual may deal with his farming property. (*United States v. Canfield*, 167 U. S., 524.)
4. Section 24 of the act of March 3, 1891, authorizing the President of the United States to set apart and reserve public lands bearing forests as national forests, is constitutional.
5. The act of June 4, 1897, conferring upon the Secretary of Agriculture authority to make rules and regulations for the administration of the national forests, is constitutional, and the regulations of the Secretary of Agriculture, made and promulgated thereunder, requiring all persons to secure permits before grazing any stock in a national forest, is valid and enforceable. (*United States v. Grimaud*, decided same day.)
6. Statutes providing that no recovery can be had for damages done by trespassing animals unless the land had been inclosed with a fence of the size and material required by State law do not give permission to the owner of cattle to use another's unfenced land as a pasture, and, therefore, if the statute of Colorado requiring owners to fence their land against straying stock is at all enforceable against the United States such a statute does not afford immunity to one who intentionally and willfully pastures and allows his stock to graze in the national forests.

The cases of *United States v. Grimaud, Carajous, and Inda*, consolidated for consideration by the Supreme Court, were criminal prosecutions for pasturing stock on the Sierra National Forest, Cal., in violation of the regulations of the Secretary of

Agriculture, which required all persons to secure a permit before grazing stock on a forest reserve. The defendants demurred to the indictments on the ground that the act of June 4, 1897, is unconstitutional in that it attempts to delegate to the Secretary of Agriculture legislative power. The district court sustained the demurrers, and the United States prosecuted a writ of error direct to the Supreme Court. The substance of the decision is as follows:

1. The act of June 4, 1897 (30 Stat., 11), authorizing the Secretary of Agriculture to make such rules and regulations and establish such service as will insure the objects of the national forests, namely, to regulate their occupancy and use and to preserve the forests thereon from destruction, and prescribing punishment for any violation of such rules and regulations, does not confer upon the Secretary of Agriculture legislative power, but merely authorizes him to exercise administrative functions in the management of the national forests, which, because of the various and varying details of such management, can not be provided in general regulations enacted by Congress, and the act is constitutional.

2. The authority to make administrative rules is not a delegation of legislative power, nor are such rules raised from an administrative to a legislative character because the violation thereof is punishable as a public offense.

3. Although there is no act of Congress which in express terms declares that it shall be unlawful to graze sheep on a national forest, and although the act of June 4, 1897, provides that nothing therein shall prohibit any person from entering such reservations for all proper and lawful purposes, such entry and use of the reserves is subject to the proviso, also contained in the act, that such persons comply with the rules and regulations covering such reservations; and as the act, not the Secretary of Agriculture, makes it an offense to violate such regulations, the grazing of sheep on the reservations without complying with the regulations of the Secretary of Agriculture, which require that a permit be obtained before grazing sheep on the reservations, is unlawful and an indictable offense.

4. The regulation promulgated by the Secretary of Agriculture on June 12, 1906, providing that "all persons must secure permits before grazing any stock in a forest reserve, except the few head in actual use by prospectors, campers, and travelers, and milch or work animals, not exceeding a total of six head, owned by bona fide settlers residing in or near a forest reserve, which are excepted and require no permit," is valid and enforceable, and a person who drives and grazes sheep upon a national forest in violation of such regulations is making unlawful use of the Government property and renders himself liable to the penalty imposed by Congress.

5. The Secretary of Agriculture has the power to impose a charge for the privilege of grazing on the national forests. In addition to the general power conferred by the act of June 4, 1897, the act of February 1, 1905, which declares "that all money received from the sale of any products or the use of any land or resources of said forest reserves shall be covered into the Treasury of the United States and for a period of five years from the passage of this act shall constitute a special fund available, until expended, as the Secretary of Agriculture may direct, for the protection, administration, improvement, and extension of Federal forest reserves," and also subsequent acts providing that money received from any source of forest-reserve revenues shall be covered into the Treasury, and a part thereof turned over to the States and Territories in which the national forests are located, to be expended for public schools and roads, clearly indicate that Congress intended that the Secretary of Agriculture might make charges out of which a revenue from forest reserves was expected to arise.

During the latter part of the fiscal year the Forester was advised by telegram that two forest rangers in New Mexico had been arrested and were then in custody of the Territorial authorities on the charge of murder. It appeared from the telegram that these officers, while attempting to apprehend a man for alleged violation of the stock law of New Mexico, were forced to kill the offender in order to defend themselves. As soon as the matter was brought to the attention of the Solicitor a full report was required, and upon its receipt and examination a letter was prepared for your signature to the Attorney General requesting that he instruct the United States attorney to apply for a writ of habeas corpus to release the rangers. A petition for the writ was prepared by the district assistant to the Solicitor and the United States attorney, was promptly filed, and after argument the writ was granted by the court and the rangers released from custody.

As a result of the disturbed conditions on the Alamo National Forest arising out of the stubborn and determined efforts on the part of certain stockmen to graze their stock thereon in violation of the regulations of this department, the supervisor of the Forest and six of his assistants were indicted by the New Mexico Territorial grand jury on the charge of larceny, the charge being based upon the removal by the officers from the Forest of certain cattle grazing in trespass thereon. Several of the indicted officers were arrested and placed under bond. At this juncture the department requested the Department of Justice to intervene. The United States attorney filed a demurrer to the indictments, which, after argument, was sustained, and the cases closed. The decision of the court in this matter was not published, and therefore is available only to those who inspect the record in the court.

Other decisions of the courts are mentioned in this report under their appropriate headings.

MISCELLANEOUS CASES.

ASSAULTS ON DEPARTMENT INSPECTORS.

Three instances of apparent violations of section 62 of the Criminal Code of the United States (34 Stat., 1088, 1100), based upon assaults on inspectors of the Bureau of Animal Industry in connection with or on account of the performance of their duties, occurred during the period covered by this report. These cases were promptly reported to the Attorney General with requests that they be vigorously prosecuted. In one case the grand jury failed to return a true bill, and the other two cases were pending at the close of June 30, 1911. (Department of Agriculture Miscellaneous Cases Nos. 111, 115, and 116.)

IMPERSONATION OF AGENTS OF THE DEPARTMENT.

In December, 1910, Fred Worden was charged with an apparent violation of section 32 of the Criminal Code of the United States (34 Stat., 1088), in falsely representing himself to be an employee of the Department of Agriculture and securing money through that misrepresentation. Worden pleaded guilty and was sentenced to 18 months in the United States penitentiary at Atlanta, Ga. (Department of Agriculture Miscellaneous Case No. 113.)

There was also reported to the Department of Justice during the period covered by this report an apparent violation of section 32 of the Criminal Code of the United States on the part of a person who was selling mushroom spawn, falsely representing himself to be an agent of the department. This case was pending at the close of June 30, 1911. (Department of Agriculture Miscellaneous Case No. 114.)

FRAUDULENT INDORSEMENT OF A CHECK.

The department discovered in this case that a check drawn in favor of a contractor with the department had been fraudulently indorsed, and promptly reported the facts to the Attorney General for appropriate action. This case was pending at the close of June 30, 1911. (Department of Agriculture Miscellaneous Case No. 124.)

CASES IN THE COURT OF CLAIMS.

There has been no change in the status of *Thomas H. Reeves v. The United States* (Court of Claims, No. 30615) since the publication of the last annual report of this office. The suit involves a claim for salary alleged to be due to the petitioner from the department. The last docket entry was under date of February 27, 1909, when certain department records, called for by the petitioner, were filed.

Charles H. Sanborn v. The United States (Court of Claims No. 30347) was pending at the close of June 30, 1911, on a motion for appeal to the Supreme Court of the United States, filed by the claimant. The suit involved a claim for \$4,275, on an alleged breach of contract on the part of the department in connection with a contract for the installation of the heating, ventilation, and special piping systems of two laboratory buildings for the Department of Agriculture. On February 27, 1911, the court handed down a judgment in favor of the claimant in the sum of \$700. A motion was filed by both claimant and defendants on March 9, 1911, for a new trial, which was granted. On March 27, 1911, the opinion of February 27, 1911, was withdrawn; the order granting a new trial and withdrawing the opinion of February 27, 1911, was later vacated, the opinion of February 27, 1911, being reinstated, thereby entering judgment against the United States for \$700. On May 27, 1911, counsel for the claimant filed notice of a motion for an appeal to the Supreme Court of the United States.

John M. Beavers v. The United States (Court of Claims No. 30376) involved claim for rent of premises No. 1316 B Street SW. Petition was filed claiming \$740; judgment was entered December 12, 1910, in favor of claimant for \$125.

SUIT AGAINST DEPARTMENT INSPECTOR.

The case of *Gutierrez v. Wiley* was pending on appeal to the highest court of New Mexico at the close of June 30, 1911. As stated in the annual report of this office for the fiscal year 1910, this was a civil action for damages instituted against Inspector Wiley by the plaintiff, Gutierrez, on October 13, 1908, based on the alleged negligence of the inspector in dipping a flock of sheep, the property of the plaintiff. Inspector Wiley was acting in cooperation with the Territorial authorities in the enforcement of their regulations for the eradication of sheep scabies at the time the sheep of the plaintiff were dipped by him. Gutierrez claimed damages in the sum of \$1,276. Judgment was entered in the court below for \$764.75.

AGREEMENTS FOR THE SEVERAL BUREAUS, OFFICES, AND DIVISIONS.

BUREAU OF PLANT INDUSTRY.

There were 104 contracts, 36 renewals of contracts, 35 leases, 31 renewals of leases, 1 letter terminating a lease, 6 bonds for temporary special disbursing agents, and 1 deed prepared for the Bureau of Plant Industry during the fiscal year 1911. This is an increase of 2 renewals of leases and 3 bonds, and a decrease of 2 contracts, 6 renewals of contracts, and 5 letters terminating leases over the fiscal year 1910.

BUREAU OF ANIMAL INDUSTRY.

There were 36 contracts, 12 renewals of contracts, 48 leases, 24 renewals of leases, 1 letter terminating a lease, and 1 bond for temporary special disbursing agent prepared for the Bureau of Animal Industry during the fiscal year 1911. This is an increase of 12 contracts, 13 leases, and 1 bond, and a decrease of 1 renewal of contract, 16 renewals of leases, and 1 letter terminating lease over the fiscal year 1910.

WEATHER BUREAU.

There were 10 contracts, 37 renewals of contracts, 22 leases, 96 renewals of leases, and 1 letter terminating a lease prepared, and 47 contracts and 1 lease examined during the fiscal year 1910 for the Weather Bureau. This is an increase of 6 contracts, 22 leases, 37 renewals of contracts, and 96 renewals of leases, and a decrease of 5 letters terminating leases and 49 renewals examined over the fiscal year 1910.

FOREST SERVICE.

There were 6 contracts, 7 leases, 3 renewals of leases, and 1 bond prepared for the Forest Service in Washington during the fiscal year 1911. This is a decrease of 27 contracts, 9 leases, 7 bonds, and 2 renewals from the previous fiscal year.

BUREAU OF CHEMISTRY.

There were 3 contracts, 14 leases, 6 renewals of leases, 1 bond for temporary special disbursing agent, and 1 letter terminating a lease prepared for the Bureau of Chemistry during the fiscal year 1911. This is an increase of 4 leases and 1 bond, and a decrease of 7 contracts, 16 renewals of leases, and 1 letter terminating a lease over the fiscal year 1910.

OFFICE OF EXPERIMENT STATIONS.

There were 5 contracts, 1 renewal of a contract, 14 leases, 2 renewals of leases, and 1 bond for temporary special disbursing agent prepared for the Office of Experiment Stations during the fiscal year 1911. This is an increase of 2 contracts, 1 renewal of contract, 10 leases, and 1 bond, and a decrease of 5 renewals of leases over the fiscal year 1910.

BUREAU OF ENTOMOLOGY.

There were 9 contracts, 11 leases, 6 renewals of leases, and 2 bonds prepared for the Bureau of Entomology during the fiscal year 1911. This is an increase of 1 bond, and a decrease of 5 contracts, 13 leases, and 11 renewals of leases over the fiscal year 1910.

OFFICE OF PUBLIC ROADS.

There were 1 contract and 1 renewal of a lease prepared for the Office of Public Roads in 1911, a decrease of 1 lease and 1 bond, and an increase of 1 renewal over the previous fiscal year.

DIVISION OF PUBLICATIONS.

There were 1 contract, 1 lease, and 1 renewal of a contract prepared for the Division of Publications in 1911, an increase of 1 lease over the fiscal year 1910.

COMMITTEE ON BUILDINGS.

During the fiscal year 1911 one contract was prepared, while in 1910 one lease was prepared for the committee on buildings.

BUREAU OF STATISTICS.

During the fiscal year 1911 one contract was prepared for the Bureau of Statistics, while in 1910 no legal instruments were prepared.

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

There were 3 contracts and 5 bonds for temporary special disbursing agents prepared for the Division of Accounts and Disbursements during the fiscal year 1911, while in 1910 there were prepared 34 such contracts, a decrease in 1911 of 31 contracts and an increase of 5 bonds.

OFFICE OF CHIEF CLERK.

During 1911 there were prepared 1 contract and 2 leases for the office of the chief clerk against none in 1910.

OFFICE OF CHIEF ENGINEER.

During the fiscal year 1911 one contract was prepared for the office of the chief engineer; none were prepared in 1910.

INSECTICIDE AND FUNGICIDE BOARD.

During the fiscal year 1911 three contracts were prepared for the insecticide and fungicide board.

RECAPITULATION.

The following table presents a recapitulation of contracts and leases prepared for the various bureaus, offices, and divisions of the department in the fiscal year 1911, as compared with the number prepared in the fiscal year 1910:

Bureau, division, or office.	1910		1911	
	Contracts.	Leases.	Contracts.	Leases.
Bureau of Plant Industry.....	106	35	104	35
Bureau of Animal Industry.....	24	35	36	48
Weather Bureau.....	4	0	10	22
Forest Service.....	33	16	6	7
Bureau of Chemistry.....	10	10	3	14
Experiment Stations.....	3	4	5	14
Bureau of Entomology.....	14	24	9	11
Office of Public Roads.....	1	1	1	0
Division of Publications.....	1	0	1	1
Committee on buildings.....	0	1	1	0
Bureau of Statistics.....	0	0	1	0
Division of Accounts.....	34	0	3	0
Office of chief clerk.....	0	0	3	2
Office of chief engineer.....	0	0		0
Insecticide and fungicide board.....	0	0		0
Total.....	230	126	185	154

Total contracts and leases in 1910.....	356
Total contracts and leases in 1911.....	339
Decrease in 1911.....	17

PATENTS FOR DEDICATION TO THE PUBLIC.

The work of this office in prosecuting applications for patents for employees of the department, to be dedicated to the public (act of Mar. 3, 1883, 22 Stat., 625), has been fully explained in the preceding annual reports of this office. During the previous year 9 applications for letters patent were filed and a like number were presented for prosecution in the fiscal year 1911. Of the cases pending, 10 patents were allowed. During the preceding year 5 patents were allowed and 1 disallowed. At page 192 of this report will be found a table, setting forth the details of the patent causes in which action was taken by this office during the fiscal year 1911. As will be noted, the inventions cover a wide range, including a plant-trimming machine, process for wood impregnation, camera support, machine for testing the life of typewriter ribbons, devices for marking meats, and a method for constructing macadam roads.

PUBLICATIONS OF THE OFFICE.

In addition to the 442 notices of judgment published by authority of section 4 of the food and drugs act and discussed in detail in another part of this report, the office issued 20 circulars, embodying decisions of the courts construing the statutes intrusted to the department for execution. Eight of these embodied decisions on cases arising under the 28-hour law, 6 under the food and drugs act, 1 under the live-stock quarantine act, and 3 of the acts of Congress providing for the protection of the National Forests, 1 an opinion of the Acting Attorney General, and 1 a decision in a case arising under the Lacey Act. At the close of June 30, 1911, the office had in preparation a supplement to the annotated edition of the 28-hour law issued on October 2, 1909, the purpose of which was to bring up to date the original edition. There was also in preparation a revision of the compilation entitled "Laws Applicable to the Department of Agriculture," the first edition of which was published in 1908, and embraced a compilation of all statutes, in effect at that time, applicable to the Department of Agriculture. There was also being prepared a compilation of references to the legislative history of acts of Congress enforced by the department for use in connection with the construction of any of the provisions contained in such statutes.

GENERAL AND SPECIAL ORDERS ISSUED BY THE SECRETARY OF AGRICULTURE DURING THE FISCAL YEAR 1911.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., September 9, 1910.

SPECIAL ORDER.

To the chiefs of bureaus, independent offices, and divisions, the Forest Service:

Section 4 of the act making appropriations for the legislative, executive, and judicial expenses of the Government for the fiscal year ending June 30, 1911, reads as follows:

"SEC. 4. That hereafter all supplies of fuel, ice, stationery, and other miscellaneous supplies for the executive departments and other Government establishments in Washington, when the public exigencies do not require the immediate delivery of the article, shall be advertised and contracted for by the Secretary of the Treasury, instead of by the several departments and establishments, upon such days as he may designate. There shall be a general supply committee in lieu of the board provided for in section thirty-seven hundred and nine of the Revised Statutes as amended, composed of officers, one from each such department, designated by the head thereof, the duties

of which committee shall be to make, under the direction of the said Secretary, an annual schedule of required miscellaneous supplies, to standardize such supplies, eliminating all unnecessary grades and varieties, and to aid said Secretary in soliciting bids based upon formulas and specifications drawn up by such experts in the service of the Government as the committee may see fit to call upon, who shall render whatever assistance they may require. The committee shall aid said Secretary in securing the proper fulfillment of the contracts for such supplies, for which purpose the said Secretary shall prescribe, and all departments comply with, rules providing for such examination and tests of the articles received as may be necessary for such purpose, in making additions to the said schedule, in opening and considering the bids, and shall perform such other similar duties as he may assign to them: *Provided*, That the articles intended to be purchased in this manner are those in common use by or suitable to the ordinary needs of two or more such departments or establishments; but the Said secretary shall have discretion to amend the annual common supply schedule from time to time as to any articles that in his judgment can as well be thus purchased. In all cases only one bond for the proper performance of each contract shall be required, notwithstanding that supplies for more than one department or Government establishment are included in such contract. Every purchase or drawing of such supplies from the contractor shall be immediately reported to said committee. No disbursing officer shall be a member of such committee. No department or establishment shall purchase or draw supplies from the common schedule through more than one office or bureau, except in case of detached bureaus or offices having field or outlying service, which may purchase directly from the contractor with the permission of the head of their department: *And provided further*, That telephone service, electric light, and power service purchased or contracted for from companies or individuals shall be so obtained by him."

In regard to the purchase of supplies under this law, the Attorney General, in an opinion rendered to the Secretary of the Treasury under date of July 25, 1910, held that while the general provision is that each department and establishment shall draw its supplies through one office or bureau, bureaus or offices having a field or outlying service may, by permission of the head of the department, be excluded entirely from the general rule and order all of their supplies, those needed for use in the city of Washington, as well as elsewhere, directly from the contractor.

So far as the Department of Agriculture is concerned, supplies are now purchased by its several bureaus in conformity with this provision of law and the Attorney General's opinion; but in order that specific authority may exist under the law cited, which supersedes former statutes, I hereby authorize the chiefs of the following-named bureaus to purchase supplies, for use in the city of Washington or elsewhere, directly from the contractors:

Weather Bureau, Bureau of Animal Industry, Bureau of Plant Industry, Forest Service, Bureau of Chemistry, Bureau of Soils, and Bureau of Statistics.

The Attorney General also held the opinion that contracts for telephone service, electric light, and power service in the District of Columbia must be contracted for by the Secretary of the Treasury. The necessary action has already been taken to carry into effect the will of Congress so far as it affects the Department of Agriculture.

JAMES WILSON,
Secretary.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., October 14, 1910.

SPECIAL ORDER.

To the chiefs of bureaus, offices, and independent divisions:

In order that no milk containing extraneous matter, raw milk from cows not known to be free of tuberculosis, or milk of unknown origin may be sold within certain buildings occupied by the Department of Agriculture in Washington, D. C., it is hereby ordered that no milk shall be sold within any building occupied by the Department of Agriculture which is not equal to the classification as defined in Bureau of Animal Industry Circular 114.

The determinations as to the standards of such milk shall be made by the Dairy Division, Bureau of Animal Industry.

Officers of the various bureaus and divisions in which milk is used will see that this order is enforced.

Effective October 25, 1910.

JAMES WILSON, *Secretary of Agriculture.*

Attest:

C. O. CLARK, *Chief Clerk.*

[Transcript from Bureau of Animal Industry Circular 114, relating to classification of milk.]

CLASSIFICATION OF MILK.

In order that the milk supply of the District may be pure, it must come from healthy cows, properly fed, that are neither about to calve nor have recently calved. The milk from these cows must be drawn in a cleanly manner and be promptly cooled. All persons engaged in handling milk must be free from communicable diseases and of cleanly habits. All receptacles into which the milk passes and all utensils and apparatus used in handling it must be perfectly clean, and the milk after having been promptly cooled must be kept cool until delivered to the consumer. Actually to attain ideal conditions with respect to milk is difficult and expensive, and adds materially to the cost of the milk, and therefore to the selling price. But to undertake earnestly to approximate such conditions is less difficult and less expensive, and for practical purposes may be regarded as yielding a reasonably satisfactory and reasonably safe milk.

The conference recommends that there be recognized by law three grades of milk, as follows:

Class 1. Certified milk.—The use of this term should be limited to milk produced at dairies subjected to periodic inspection and the products of which are subjected to frequent analyses. The cows producing such milk must be properly fed and watered, free from tuberculosis, as shown by the tuberculin test, and from all other communicable diseases, and from all diseases and conditions whatsoever likely to deteriorate the milk. They are to be housed in clean stables, properly ventilated, and to be kept clean. All those who come in contact with the milk must exercise scrupulous cleanliness, and such persons must not harbor the germs of typhoid fever, tuberculosis, diphtheria, and other infections liable to be conveyed by the milk. Milk must be drawn under all precautions necessary to avoid infection, and be immediately strained and cooled, packed in sterilized bottles, and kept at a temperature not exceeding 50° F. until delivered to the consumer. Pure water, as determined by chemical and bacteriological examination, is to be provided for use throughout the dairy farm and dairy. Certified milk should not contain more than 10,000 bacteria per cubic centimeter, and should not be more than 12 hours old when delivered. Such milk shall be certified by the health officer of the District of Columbia.

Class 2. Inspected milk.—This term should be limited to clean raw milk from healthy cows, as determined by the tuberculin test and physical examination by a qualified veterinary surgeon. The cows are to be fed, watered, housed, and milked under good conditions, but not necessarily equal to the conditions provided for class 1. All those who come in contact with the milk must exercise scrupulous cleanliness, and such persons must not harbor the germs of typhoid fever, tuberculosis, diphtheria, and other infections liable to be conveyed by the milk. This milk is to be delivered in sterilized containers, and is to be kept at a temperature not exceeding 50° F. until it reaches the consumer. It shall contain not more than 100,000 bacteria per cubic centimeter.

Class 3. Pasteurized milk.—Milk from the dairies not able to comply with the requirements specified for the production of milk of classes 1 and 2 is to be pasteurized before being sold, and must be sold under the designation "pasteurized milk." Milk for pasteurization shall be kept at all times at a temperature not exceeding 60° F., while in transit from the dairy farm to the pasteurization plant, and milk after pasteurization shall be placed in sterilized containers and delivered to the consumer at a temperature not exceeding 50° F. All milk of an unknown origin shall be placed in class 3 and subjected to clarification and pasteurization. No cow in any way unfit for the production of milk for use by man, as determined upon physical examination by an authorized veterinarian, and no cow suffering from a communicable disease, except as specified below, shall be permitted to remain on any dairy farm on which milk of class 3 is produced, except that cows which upon physical examination do not show physical signs of tuberculosis may be included in dairy herds supplying milk of this class, although they may have reacted to the tuberculin test.

This milk is to be clarified and pasteurized at central pasteurization plants, which shall be under the personal supervision of an officer or officers of the health department. These pasteurizing plants may be provided either by private enterprise or by the District Government, and shall be located within the city of Washington.

By the term "pasteurization," as used herein, is meant the heating of milk to a temperature of 150° F. or 65° C. for 20 minutes, or 160° F. or 70° C. for 10 minutes, as soon as practicable after milking, in inclosed vessels, preferably the final containers, and after such heating immediate cooling to a temperature not exceeding 50° F. or 10° C.

No milk shall be regarded as pure and wholesome which, after standing for two hours or less, reveals a visible sediment at the bottom of the bottle.

No dairy farm shall be permitted to supply milk of a higher class than the class for which its permit has been issued, and each dairy farm supplying milk of a specified class shall be separate and distinct from any dairy farm of a different class; the same owner however, may supply different classes of milk, providing the dairy farms are separate and distinct, as above indicated.

GENERAL ORDER NO. 142.

DEPARTMENT OF AGRICULTURE,
October 1, 1910.

To the officers and employees of the Department of Agriculture:

Your attention is respectfully invited to the following rules and regulations of the Civil Service Commission pertaining to political assessments and partisan political activity of officeholders, and all employees of this department are enjoined to strictly adhere thereto:

1. POLITICAL ACTIVITY.

Rule I, section 1, of the Civil Service Rules reads as follows:

"No person in the executive civil service shall use his official authority or influence for the purpose of interfering with an election or affecting the result thereof. Persons who by the provisions of these rules are in the competitive classified service, while retaining the right to vote as they please and to express privately their opinions on all political subjects, shall take no active part in political management or in political campaigns."

The first sentence of the rule applies to every person in the executive civil service, irrespective of the method of his appointment. The second sentence of the rule applies to all persons holding positions in the competitive classified service, whether the appointment be permanent or temporary in character, and by departmental action has also generally been made applicable to unclassified laborers.

The following forms of activity have been held to be forbidden by this provision:

Service on political committees; service as delegates to State, county, or district conventions of a political party, although it was understood that the employees were not "to take or use any political activity in going to these conventions or otherwise violate the civil-service rules;" service as officer of a political club, as chairman of a political meeting, or as secretary of an antisaloon league; continued political activity and leadership; activity at the polls on election day; the publication or editing of a newspaper in the interests of a political party; the publication of political articles bearing on qualifications of different candidates; the distribution of political literature; holding office in a club which takes an active part in political campaigns or management; making speeches before political meetings or clubs; activity in local-option campaigns; circulation of petitions having a political object, of petitions proposing amendments to municipal charter, of petitions favoring candidates for municipal offices, and of local-option petitions; candidacy for or holding of elective office; accepting nomination for political office with the intention of resigning from the competitive service if elected; recommendation by clerks and carriers of a person to be postmaster; service as a commissioner of election in a community where it was notorious that a commissioner of election must be an active politician; service as inspector of election, ballot clerk, ballot inspector, judge of election, or member of election board; or generally any form of activity in political management or political campaigns, though not specifically mentioned above.

Inasmuch as the issuance of a certificate for reinstatement is discretionary with the Civil Service Commission, no certificate will be issued in any case where the party applying for reinstatement has previously resigned with a view of running for office, or with a view of indulging in a degree of political activity which would be prohibited if he had remained in the service, and who afterwards, having failed in his candidacy or having indulged in the contemplated activity, seeks reinstatement.

2. POLITICAL ASSESSMENTS OR CONTRIBUTIONS.

The civil-service act provides that "no person in the public service is for that reason under any obligations to contribute to any political fund or to render any political service, and * * * he will not be removed or otherwise prejudiced for refusing to do so." Section 118 of the Criminal Code provides that no Federal officer or employee shall, directly or indirectly, solicit or receive, or be in any manner concerned in soliciting or receiving any political assessment, subscription, or contribution from any other Federal officer or employee. Section 120 of the Criminal Code prohibits the discharge, promotion, or degrading of any officer or employee for giving

or failing to make any political contribution. Section 121 of the Criminal Code prohibits any Federal officer or employee from making any such political contribution to another Federal officer or employee, and section 119 prohibits the solicitation or receipt of any political contribution in any room or building occupied in the discharge of official duties by any officer or employee of the United States, or on other Federal premises, by any person whatsoever, whether in the public service or not. In connection with this latter provision the United States Supreme Court has held that a solicitation by letter or circular addressed and delivered by mail or otherwise to an officer or employee of the United States at the office or building in which he is employed in the discharge of his official duties is a solicitation within the meaning of the law, the solicitation taking place where the letter was received. Section 122 of the Criminal Code provides that whoever shall violate any provision of the four sections above mentioned shall be fined not more than \$5,000, or imprisoned not more than three years, or both.

It is the duty of the Civil Service Commission to see that the civil-service act and rules and the above-mentioned sections of the Criminal Code, which were originally enacted as a part of the civil-service act, are strictly enforced, and it will employ every legitimate and available means to secure the prosecution and punishment of persons who may violate them. The commission requests any person having knowledge of any such violation to lay the facts before it that it may at once take action thereon.

JAMES WILSON, *Secretary.*

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., October 15, 1910.

AMENDMENT TO GENERAL ORDER No. 87.

Referring to General Order No. 87, October 2, 1905, creating a committee on personnel for the department, C. C. Clark, chief clerk of the department, is hereby designated as a member of said committee, vice S. R. Burch, deceased.

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., October 18, 1910.

SPECIAL ORDER.

It is hereby ordered that the committee constituted, designated, and known as the committee on buildings, appointed on April 24, 1908, consisting of Beverly T. Gallo-way, Chief of the Bureau of Plant Industry; the late Sylvester R. Burch, chief clerk of the department; and A. Zappone, Chief of the Division of Accounts and Disbursements, is hereby dissolved, and that in lieu thereof Mr. A. Zappone, Chief of the Division of Accounts and Disbursements; Mr. C. C. Clark, chief clerk of the department; and Mr. Jasper Wilson, private secretary to the Secretary of Agriculture, be, and they are, in addition to their regular official duties, hereby appointed and constituted a committee to be designated and known as the committee on buildings, Mr. A. Zappone to be chairman of the said committee.

This committee shall be subject to the orders of the Secretary of Agriculture and shall direct and supervise, in the city of Washington, the construction of new buildings for the Department of Agriculture, the remodeling of buildings of the department already erected, the rental of all buildings, and the assignment of office rooms and space.

The said committee shall also act as a board of awards to consider all bids appertaining to the construction of any new buildings or the remodeling of any old buildings belonging to the department.

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 1, 1910.

SPECIAL ORDER.

In accordance with the provisions of the act of March 4, 1907 (34 Stat., 1281), it is hereby ordered that printed matter in the map stock room of the Forest Service, consisting of out-of-date proclamations, which do not constitute permanent records,

and which are obsolete and worthless, shall be delivered to the Chief of the Supply Division of this department to sell as waste paper or for destruction, and the Chief of the Supply Division is hereby authorized and directed to dispose of the same in the manner indicated.

Attest:

C. C. CLARK, *Chief Clerk.*

W. M. HAYS, *Acting Secretary.*

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 17, 1910.

SPECIAL ORDER.

It is hereby ordered that all documentary charges preferred against any person employed in any bureau, division, office, or service in the Department of Agriculture, and all documentary testimony and evidence submitted in relation thereto, or complete certified copies thereof, be deposited and filed in the office of the appointment clerk of the department for the immediate use, direction, and convenience of the Secretary of Agriculture.

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., December 21, 1910.

CIRCULAR LETTER.

The especial attention of the chiefs of bureaus, divisions, and offices in the United States Department of Agriculture is hereby called to the civil-service law, rules, and regulations, regarding transfers from the nonapportioned service to the apportioned service (i. e., to Washington, D. C.).

GENTLEMEN: The civil-service act, section 2 (22 Stat. L., 403), provides:

"That it shall be the duty of the Civil Service Commissioners: First, to aid the President, as he may request, in preparing suitable rules for carrying this act into effect, and when said rules shall have been promulgated it shall be the duty of all officers of the United States in the departments and offices to which any such rules may relate to aid, in all proper ways, in carrying said rules, and any modification thereof, into effect. Second, and among other things, said rules shall provide and declare, as nearly as the conditions of good administration will warrant, as follows: Third, appointments to the public service aforesaid in the departments at Washington shall be apportioned among the several States and Territories and the District of Columbia upon the basis of population as ascertained at the last preceding census."

The acts of July 11, 1890, and July 2, 1909, relating to the apportionment are intended to secure the faithful application of the law.

The above enactments compel the observance of the apportionment in all cases of the proposed transfer from the nonapportioned to the apportioned service, which transfers can not be authorized from States which have received more than the average share of apportioned appointments.

Rule 10, section 8, clause (c): "The apportionment must be observed, unless waived by the commission upon the certificate of the appointing officer that the transfer is required in the interests of good administration, setting forth fully and in detail the reasons therefor.

"A transfer from the nonapportioned to the apportioned service is charged to the apportionment of the State of which the person transferred is a legal resident. If this State has received an excessive share of appointments, such a transfer is in the nature of an exception to section 2 of the civil-service act, which provides for the apportionment of appointments to the public service in the departments at Washington among the several States and Territories and the District of Columbia. Such transfers are therefore not authorized, unless the person whose transfer is sought possesses qualifications not possessed by eligibles tested by competitive examination, and it is not practicable to fill the position by the transfer or promotion of a person in the apportioned service.

"The interests of good administration may sometimes permit, though they can very seldom require, a transfer, unless the employee is possessed of some unusual or highly technical knowledge, ability, or skill which is required for the most efficient performance of the duties of the position to which he is to be transferred, and which it

would be difficult or impossible to obtain through the ordinary means provided for filling such positions. If the transfer involves a promotion, the promotion rules and regulations must also be observed."

Section 8, clause (d): "He must pass an appropriate examination whenever different tests are prescribed for original entrance to the position to which transfer is proposed."

Section 8, clause (e): "He shall not be transferred unless, in the judgment of the commission, he possesses experience, qualifications, or training, which are required for the proper performance of the duties of the position to which transfer is proposed, and which render necessary in the interests of the service the filling of the position by his transfer, rather than by an original appointment or promotion in the manner provided by the civil-service act."

The following is from a letter of the Civil Service Commission, signed John C. Black, president:

"The commission can not properly pass upon the permissibility of a transfer, as it is required to do by the rules, until it is in possession of all the reasons favoring the transfer, and a full statement of such reasons in connection with each request will greatly expedite action by the commission, and obviate the necessity for further correspondence."

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., December 22, 1910.

GENERAL ORDER No. 143.

To assist the Secretary of Agriculture in the enforcement of the insecticide act of 1910, the following officers of the Department of Agriculture are appointed as members of the insecticide and fungicide board, which is hereby created:

Dr. Marion Dorset, of the Bureau of Animal Industry, chairman; Mr. M. B. Waite, of the Bureau of Plant Industry; Prof. A. L. Quaintance, of the Bureau of Entomology; and Dr. J. K. Haywood, of the Bureau of Chemistry. A. W. Smith is hereby designated executive officer of the board.

The operations of the board will be conducted under rules and regulations to be approved by the Secretary of Agriculture.

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 1, 1911.

REGULATIONS GOVERNING LEAVES OF ABSENCE IN THE DEPARTMENT OF AGRICULTURE.

GENERAL ORDER NO. 144.

To officers and employees of the Department of Agriculture:

Pursuant to the act of Congress of March 15, 1898, as amended by the acts of July 7, 1898, and February 24, 1899,¹ authorizing leaves of absence, the following regulations are hereby promulgated, effective January 1, 1911, and all prior rules and regulations on this subject are revoked.

GENERAL.

1. **AUTHORITY TO GRANT LEAVES.**—The head of each bureau is authorized to grant annual leave with pay not exceeding 30 days in each calendar year, and extension of leave on account of sickness not exceeding 15 days; sick leave in excess of such 15 days to be granted in meritorious cases only, by the Secretary, on recommendation of the chief of bureau.

2. **RECORDS TO BE KEPT IN BUREAUS; TIME CLERKS.**—Uniform records of leaves of absence shall be kept in the chief clerk's office of each bureau of the department; and a time clerk shall be designated to keep such records in each bureau. Leave shall be granted to employees of the office of the Secretary upon approval of the chief clerk of the department, who shall keep in his office records of all such leave. (See par. 8.)

¹ See Appendix, p. 56.

3. **INSPECTION OF RECORDS BY CHIEF CLERK OF DEPARTMENT.**—All records of leaves of absence shall be kept up to date and shall be accessible at all times for inspection by the chief clerk of the department; there may also be required periodical reports to the chief clerk of the department.

4. **INTERPRETATION OF REGULATIONS.**—Questions of interpretation of regulations governing leaves of absence, and questions not covered by these regulations, except questions of law, shall be submitted to the chief clerk of the department for decision.

5. **APPLICATIONS FOR LEAVE.**—Applications for leave of absence shall be made upon printed forms applicable to all bureaus of the department. A supply of these forms will be furnished by the chief clerk of the department, and are intended for use in making applications for leaves of absence.

6. **FORM OF APPLICATION.**—The form of application for leave of absence shall specify the beginning and ending (both dates inclusive) of the period for which such leave is desired. It must contain memoranda of all previous absences of the applicant during the calendar year then current, which memoranda shall be prepared and signed or initialed by the time clerk of the bureau. The application must bear the signature of the applicant, the recommendation of the chief of division or office in which the applicant is serving, and the approval of the chief of bureau.

When the application for leave is on account of sickness for a period of 2 days or less, and is not accompanied by a certificate of attending physician, the certificate on the back of the form must be made by applicant and sworn to before a notary public; if the application for leave is on account of sickness for a period exceeding 2 days, the certificate of the attending physician on the back of the form must be secured and certificate of notary is not required.

The form shall provide for approval by the chief clerk of the department for sick leave exceeding 15 days, previously granted, or leave without pay.

7. **FORM OF APPLICATION FOR ANNUAL LEAVE FOR LESS THAN A DAY.**—Absence for a period less than a day may be granted upon an application form bearing the signature of the applicant, recommendation of the official in charge, and the approval of the chief or chief clerk of the bureau. A supply of these forms will be furnished by the chief clerk of the department.

8. **RECORD OF ABSENCE.**—A record of leaves of absence for each employee shall be kept by the time clerks of the bureaus, and such record shall be in the form of printed cards showing the name of the employee, the bureau in which he serves, and the date of reporting for duty. They are designed to show at a glance the total amount of leaves of absence granted, by days, months, and totals. A supply of these forms will be furnished by the chief clerk of the department, and shall be used uniformly by all bureaus.

All applications for leave when granted shall be entered by the time clerk of each bureau on the card records of absence, and the leave slips when completed, showing return to duty, shall be placed therewith; and all such records shall be carefully preserved for a period of 3 years.

All other systems of time records in use in the department shall be discontinued.

9. **NEW EMPLOYEES.**—Regular employees who have been in the service of the department for less than a year and served a probationary period of 6 months, including those reinstated, may be granted annual and sick leave of absence at the rate of $2\frac{1}{2}$ days per month of service: *Provided, however,* That persons transferred from other departments, or from one bureau or office to another within this department, may be allowed transfer of accrued leave upon statement received from the department or bureau from which the transfer is made showing the amount of leave due at the time of transfer.

10. **PROBATIONARY EMPLOYEES.**—Probationary employees in Washington, after service of 2 months, may be granted leaves of absence at the rate of $2\frac{1}{2}$ days a month, and probationary employees outside of Washington at the rate of $1\frac{1}{4}$ days a month, computed from the date of beginning of appointment.

11. **TEMPORARY EMPLOYEES.**—Temporary employees, after service of 2 months, may be granted leave of absence at the rate of $2\frac{1}{2}$ days a month, computed from the beginning of the third month.

12. **PER DIEM EMPLOYEES.**—Per diem employees shall not be granted leave with pay if their appointments state salary "for days actually employed," or if their employment is temporary. If per diem rate is simply a measure of salary and they are regularly and continuously employed without limitation, they are entitled to leave the same as those with annual or monthly rates of salary.

13. **ALLOWANCE OF LEAVE CONFINED TO CURRENT YEAR.**—Leaves of absence are not cumulative; employees who are unable to avail themselves of leave within the calendar year will not be entitled to it, or any portion thereof, in a subsequent year; nor will leave be granted to be used in one year and charged to a subsequent year.

14. ONLY ACCRUED LEAVE ALLOWED ON RESIGNATION, ETC.—On separation from the department by resignation, dismissal, or transfer, employees may be allowed only accrued leave at the rate of $2\frac{1}{2}$ days for each month of service since the first of the calendar year.

15. SUNDAYS AND LEGAL HOLIDAYS.—Sundays and legal holidays and holidays by executive order, whether for the whole or part of a day, at the beginning or end of any kind of leave, or within a period of annual leave, will not be counted as leave; but those which occur within a period of sick leave or leave without pay will be counted. (See par. 47.)

16. SATURDAY AFTERNOONS IN SUMMER.—Saturdays in July, August, and September will be charged as 4 hours in annual leave, and as a whole day in sick and without-pay leave.

17. OFFICE HOURS.—The hours of labor, unless otherwise specially ordered, shall begin at 9 o'clock a. m. and close at 4.30 p. m., with one-half hour between 12 m. and 1 p. m. for luncheon, the particular half hour within that period in the different bureaus to be designated by the chiefs of the respective bureaus. All employees shall be required to strictly observe the office hours.

In the interests of the service, so that all the employees in important offices shall not be absent at the same time, chief clerks may vary the time for luncheon of certain employees.

ANNUAL LEAVE.

18. DISTRIBUTION OF LEAVE.—In no case shall administrative officers recommend or approve the granting of leave when to allow it will cause embarrassment to the service; and leave should be distributed or allotted to employees, if necessary, in the months when the work of the office will be least affected.

19. LEAVE REVOCABLE.—Leave of absence may be revoked at any time and the employee ordered to return to duty before its expiration, should the exigencies of the service require it.

20. APPLICATION IN ADVANCE.—Application must be made in advance of the date of the beginning of the leave on the blank form provided therefor by the department, and no applicant for annual leave will be permitted to be absent from duty until notification has been received of the granting of the same.

21. CONSECUTIVE DAYS ONLY.—Application should be made for only the number of consecutive days desired.

22. LUNCHEON HALF HOUR DEDUCTED IN FRACTIONAL ABSENCE.—The luncheon half hour is deducted from annual leave for part of a day when it occurs during the absence, as from 11 a. m. to 3 p. m., which should be charged as $3\frac{1}{2}$ hours and not as 4 hours.

23. DEDUCTION FROM ANNUAL LEAVE FOR ABSENCE WITHOUT PAY.—Proportionate deduction from annual leave shall be made at the rate of 1 day for each 12 days, and multiples thereof, of furlough or leave without pay. (See also pars. 44, 45, and 46.)

24. NO LEAVE GRANTED FOR LESS THAN 15 MINUTES.—Absence less than 15 minutes will be charged as 15 minutes; and absence in excess of 15 minutes will be charged in multiples of 15 minutes.

25. TIME OF DEPARTURE AND RETURN OF EMPLOYEE TO BE NOTED.—Any administrative officer who shall receive notification from the chief clerk of bureau that leave of absence has been granted to any employee under his supervision will note the exact time of the departure of such person and the exact time of his return to duty, and return application blank promptly to the chief clerk or time clerk of the bureau.

SICK LEAVE.

26. CONDITIONS GOVERNING GRANTING OF SICK LEAVE.—An extension of leave on account of sickness, not exceeding 15 days in the calendar year, may be granted by the chief of each bureau; sick leave in excess of such 15 days previously granted may be allowed in particularly meritorious cases only, by the Secretary, on recommendation of the chief of bureau.

Sick leave may be granted upon any one of the following conditions:

(a) Where some member of the immediate family of a clerk or employee is afflicted with a contagious disease and requires the care and attendance of such employee.

(b) Where through exposure to contagious disease, whether in his own family or not, the employee's presence in the department would jeopardize the health of fellow clerks.

(c) In exceptional and meritorious cases, where a clerk or employee is personally ill, and where to limit the annual leave to 30 days in any one year would work peculiar hardship.

Condition (c) is made up of a group of facts or circumstances which must combine to authorize the granting of leave on account of personal illness. The case must be (1) exceptional, (2) meritorious, and (3) such that a denial of the leave would work not ordinary but peculiar hardship. What will in this connection constitute an "exceptional" case, a "meritorious" case, and "peculiar hardship" can not be defined in any general rule, but must depend upon the exercise of a reasonable discretion in the consideration of the circumstances.

27. LEAVE MAY BE GRANTED BEFORE ANNUAL LEAVE.—Extension of annual leave on account of sickness may be granted at any time during the year, even though no annual leave shall have been granted at the time of such extension.

28. APPLICATIONS FOR LEAVE; PHYSICIAN'S CERTIFICATE.—Applications for sick leave must be filed on the form prescribed by the department and be accompanied by a certificate, therein provided for, of the attending physician where one was employed, and in all cases where no physician was employed the specific reasons for not employing one must be stated.

29. ONLY REGULARLY PRACTICING LICENSED PHYSICIANS.—Certificates of sickness will be accepted from none but regularly practicing physicians, licensed according to law.

30. WITHOUT PHYSICIAN'S CERTIFICATE.—Sick leave will not be allowed without a physician's certificate unless application is accompanied by a sworn statement that the absence was due to illness, that the employee was unable to perform official duties, and that no physician was employed. (See par. 31.)

31. LIMITATION OF LEAVE BASED ON AFFIDAVIT.—Periods not exceeding 2 days may be granted on affidavit, and the aggregate of affidavit sick leave shall not exceed 12 days in one year.

32. NOT LESS THAN 1 DAY GRANTED.—Sick leave will not be granted for less than 1 day; absence for less than 1 day shall be charged against annual leave.

33. SLIGHT AILMENTS.—Slight ailments or indisposition will not be accepted as sufficient cause for allowing sick leave; such absences should be charged to annual leave.

34. ABSENTEES MUST REPORT FACT WITHIN 24 HOURS.—An employee absent on account of personal illness must report the fact to the chief clerk of the bureau in which employed immediately; if such report is not made within 24 hours, the time lost may be charged to annual leave or leave without pay.

35. APPLICATION MUST BE MADE WITHIN 3 DAYS.—Application for sick leave must be made within 3 days after the return of the employee to duty.

36. QUARANTINE.—When an employee has been exposed to a contagious disease against which the medical authorities quarantine the patient, he should immediately file with the chief clerk of the bureau in which employed a certificate from the attending physician, where such be the case, stating that in his judgment the presence of the employee in the office would jeopardize the health of fellow clerks. Application for leave with pay for the time lost must be accompanied by a certificate of the attending physician certifying that all danger from contagion has passed.

37. MODIFYING ANNUAL LEAVE TO SICK LEAVE.—No modification of annual to sick leave will be made unless sickness begins on or before the first day of the period granted as annual leave, when the latter may be surrendered and sick leave granted instead under the usual limitations. The circumstances and surroundings of an employee on vacation are usually so different from when on official duty that it seems beyond the intent of the law and regulations to grant sick leave during a period of annual leave.

38. DEDUCTION FROM ALLOWANCE BECAUSE OF LEAVE WITHOUT PAY.—Proportionate deduction from sick leave shall be made at the rate of 1 day for each 12 days, and multiples thereof, of furlough or leave without pay. This applies also to reinstated employees in regard to the period of their separation from the department in the current year. (See pars. 44, 45, and 46.)

39. INVESTIGATION.—The chief of bureau shall carefully consider the merits of every application for an extension of leave with pay beyond 30 days which shall be presented by his employees, in so far as the actual sickness or exposure to contagion is concerned; and shall cause to be investigated those employees who habitually apply for excessive sick leave, and if abuse of the privilege be found, report the same to the office of the Secretary.

40. PENALTIES FOR DECEPTION.—All employees will be held to a strict accountability for statements made by them of inability to perform duty. When sick leave has been granted and subsequent developments prove that it was obtained by misrepresentation, it will be charged to leave without pay, even if the offender has annual leave still due. A second attempt to mislead or deceive official superiors, directly or indirectly, in regard to absence on account of alleged sickness, will be deemed sufficient cause for dismissal.

LEAVE WITHOUT PAY.

41. **APPOINTMENT TERMINATED "WITHOUT PREJUDICE;" REINSTATEMENT.**—When an employee has been absent for more than 60 days, and there is no probability of his immediate return to duty, his appointment may be terminated "without prejudice." Such employee, however, will be eligible for reinstatement at any time within one year from the date of separation from the service.

42. **NOT A RIGHT, BUT A FAVOR.**—Leave without pay is not to be considered as a right. It may be allowed on account of sickness when the regular leave has been exhausted, but otherwise it will be granted only when, in the opinion of the chief of the bureau, the public business will not suffer by the absence and when reasonable cause is shown, such as important business or emergencies of a serious nature.

43. **APPLICATIONS.**—Applications for leave without pay must be filed on the form prescribed by the department and shall be forwarded with recommendation of the chief of the bureau, to the chief clerk of the department for approval.

44. **DEDUCTION OF PAY FOR ABSENCE IN EXCESS OF LEGAL LIMIT.**—Absence of employees in excess of the legal allowance with pay must be covered by an application for leave of absence without pay for 1 day or more, as no excess can be permitted without a deduction therefor. In the case of a deduction of a day's pay where the employee has not been absent an entire day he may take the balance of the day's time without further deduction, subject to approval by the chief clerk, provided the time is taken in the same year. (See par. 38.)

45. **BASIS FOR DEDUCTION FROM ANNUAL AND SICK ALLOWANCE.**—A proportionate deduction from allowance of both annual and sick leave shall be made at the rate of 1 day for each 12 days, and multiples thereof, of furlough or leave without pay in the current year; and in the case of employees outside of Washington, at the rate of 1 day for each 24 days and multiples thereof.

46. **RETROACTIVE DEDUCTION FROM LEAVE.**—If absence without pay for 12 days and multiples thereof should occur after leave is exhausted, application for leave without pay to modify the excess of leave already taken will be required.

47. **SUNDAY BETWEEN SICK LEAVE AND LEAVE WITHOUT PAY COUNTED.**—When sick leave expires on (including) Saturday and the employee continues absent, beginning Monday following on leave without pay, the intervening Sunday is charged without pay.

48. **ABSENCE WITHOUT LEAVE.**—Immediate notification must be given to chief clerks of bureaus of all absence from duty for any cause, without leave having been previously asked for and granted. Any employee who is absent without leave for any cause may also be required to explain to his immediate superior, in writing, at the earliest practicable moment, the cause of his absence and of his failure to ask for permission to be absent. If it is found that he was absent upon insufficient cause, or if his failure to obtain permission to be absent is not satisfactorily accounted for, the time lost will be charged to leave without pay, and such further action as may be deemed necessary will be taken. Avoidable or willful absence without leave is an offense against office discipline.

EMPLOYEES OUTSIDE OF WASHINGTON, D. C.

49. **REGULATIONS APPLICABLE TO FIELD SERVICE.**—The foregoing regulations are applicable, within legal limits and as far as practicable, to the field and station services connected with this department outside of Washington, D. C.

50. **LEAVE OF ABSENCE OF EMPLOYEES.**—The act making appropriations for the Department of Agriculture, approved May 23, 1908, provides that "The employees of the Department of Agriculture outside of the city of Washington may hereafter, in the discretion of the Secretary of Agriculture, be granted leave of absence not to exceed 15 days in any one year, which leave may in exceptional and meritorious cases, where such an employee is ill, be extended in the discretion of the Secretary of Agriculture, not to exceed 15 days additional in any one year."

51. **APPLICATIONS.**—An employee whose official station is other than Washington, D. C., who may wish to absent himself from duty for more than 5 days will be required to file with his immediate superior an application on form provided by the department, stating the period for which leave of absence is desired. Any superintendent, observer, inspector, chief of a field party, or other supervisory official receiving such an application, will promptly forward the same, with his recommendation, to the chief of his bureau at Washington, who will at once approve or disapprove the application. Persons not assigned to any station or party will address their applications directly to the chief of their respective bureaus.

52. LEAVE FOR 5 DAYS OR LESS.—Observers, inspectors, superintendents in charge of stations, chiefs of field parties, or other supervising officials may grant to employees of their respective offices or forces permission to be absent for periods not exceeding 5 days, but in every such case the absence must be promptly reported to the chief of the bureau at Washington, who will cause the same to be entered upon and filed with the employee's record.

53. FIELD EMPLOYEES SERVING PART OF TIME IN WASHINGTON.—Regular employees of the department outside of Washington, who are transferred to the service in Washington, may be granted leaves of absence at the rate of $1\frac{1}{4}$ days per month until date of transfer, and $2\frac{1}{4}$ days per month in Washington. Field employees serving temporarily in Washington will not be granted leave in excess of 15 days annual and 15 days sick in any one year.

54. ENFORCEMENT OF REGULATIONS.—Chiefs of bureaus and all supervisory officials will be held strictly responsible and accountable for the enforcement of these regulations.

JAMES WILSON, *Secretary*.

APPENDIX.

PROVISIONS OF LAW RELATING TO LEAVES OF ABSENCE OF CLERKS AND OTHER EMPLOYEES.

In section 7 of the legislative, executive, and judicial appropriation act approved March 15, 1898, it is provided that—

"* * * The head of any department may grant thirty days' annual leave with pay in any one year to each clerk or employee: *And provided further*, That where some member of the immediate family of a clerk or employee is afflicted with a contagious disease and requires the care and attendance of such employee, or where his or her presence in the department would jeopardize the health of fellow clerks, and in exceptional and meritorious cases, where a clerk or employee is personally ill and where to limit the annual leave to thirty days in any one calendar year would work peculiar hardship, it may be extended, in the discretion of the head of the department, with pay, not exceeding thirty days in any one case in any one calendar year.

"This section shall not be construed to mean that so long as a clerk or employee is borne upon the rolls of the department in excess of the time herein provided for or granted that he or she shall be entitled to pay during the period of such excessive absence, but that the pay shall be stopped upon the expiration of the granted leave."

The deficiency appropriation act approved July 7, 1898, provides that—

"* * * nothing contained in section seven of the act making appropriations for legislative, executive, and judicial expenses of the Government for the fiscal year eighteen hundred and ninety-nine, approved March fifteenth, eighteen hundred and ninety-eight, shall be construed to prevent the head of any executive department from granting thirty days' annual leave with pay in any one year to a clerk or employee, notwithstanding such clerk or employee may have had during such year not exceeding thirty days' leave with pay on account of sickness as provided in said section seven."

The legislative, executive, and judicial act approved February 24, 1899, provides that—

"* * * the thirty days' annual leave of absence with pay in any one year to clerks and employees in the several executive departments authorized by existing law shall be exclusive of Sundays and legal holidays."

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 24, 1911.

SPECIAL ORDER.

Owing to the death of Dr. C. A. Herter, a member of the referee board of consulting scientific experts to the Secretary of Agriculture, special order, dated February 24, 1908, is hereby amended so as to include the name of Dr. Theobald Smith as a member of said board, vice Dr. Herter.

Said board shall therefore consist of the following persons: Dr. Ira Remsen, chairman; Dr. Russell H. Chittenden; Dr. John H. Long; Dr. Alonzo E. Taylor; and Dr. Theobald Smith.

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
Washington, D. C., March 10, 1911.

SPECIAL ORDER.

It is hereby ordered, That there be, and there is hereby established, in the Bureau of Chemistry of the United States Department of Agriculture, a laboratory to be known as the physical-chemistry laboratory. This laboratory shall be charged with the study, from the physical-chemical point of view, of the action of enzymes.

This order shall take effect on March 16, 1911.

JAMES WILSON,
Secretary of Agriculture.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., April 25, 1911.

GENERAL ORDER No. 145.

An officer or employee of the Department of Agriculture, transferred from one official station to another for permanent duty, in addition to actual traveling expenses provided for in the fiscal regulations of the department, may hereafter, within the discretion and under the written instructions of the chief of the bureau, service, or independent division or office in which the officer or employee serves, be allowed freight and drayage charges for the transfer of his household effects, and of other personal property used by such officer or employee when transferred, in official work, not exceeding in all 3,500 pounds: *Provided,* That saddle and other animals will be transported at Government expense only when used in official work. (Agricultural appropriation act, Mar. 4, 1911; Public No. 478.)

Shipments under the provisions of the foregoing paragraph must be made on department bills of lading, and each account must be accompanied by the letter of instructions and the certificate of the officer best qualified to make it that the property so shipped consists of the household goods of the officer or employee transferred and is exclusively his property, that all other personal property transported is to be used in official work, and that the transportation was furnished on the occasion of his permanent transfer to a new official station.

This order supersedes all orders and regulations heretofore issued on this subject.

JAMES WILSON,
Secretary.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., June 1, 1911.

GENERAL ORDER No. 145a.

General Order No. 145, dated April 25, 1911, is hereby amended so as to permit the Forester to authorize the district foresters to issue written instructions under which transferred employees may be allowed freight and drayage charges for the transportation of their household effects and other personal property, as provided in the said general order, with the same effect as if the instructions had been issued in person by the Forester.

JAMES WILSON,
Secretary.

DEPARTMENT OF AGRICULTURE,
Washington, D. C., June 23, 1911.

SPECIAL ORDER:

It is hereby ordered that Arthur F. Kreuger, clerk in the Bureau of Statistics, act as and perform the duties of chief clerk of that bureau on July 1, 1911, and to continue such duties until further order.

JAMES WILSON,
Secretary of Agriculture.

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1632	E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded liquor from California to Arizona.	Defendant pleaded guilty; fined \$25. (Notice of Judgment 1247.)
1633	Northwest Mills Co.	Minnesota.....	Shipment of misbranded dairy food from Minnesota to Maine.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 810.)
1634	Eddy & Eddy Manufacturing Co.	Missouri, eastern district.	Shipment of adulterated and misbranded vanilla extract from Missouri to Iowa.	Information filed; defendant pleaded not guilty; mistrial; pending.
1641	Consolidated Importing Co.	Illinois, northern district.	Shipment of adulterated and misbranded brandy from Illinois to Missouri.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 183.)
1642	Colorado Canning Co.	Colorado.....	Shipment of adulterated and misbranded fruit jellies from Colorado to New Mexico.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 816.)
1644	K. J. Schmidt.....	New York, southern district.	Shipment of adulterated and misbranded vanilla flavor from New York to New Jersey.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 774.)
1645	American Cordial & Distilling Co.	California, northern district.	Shipment of misbranded "Vino Vito" from California to Arizona.	In dictum filed; pending.
1651	Interstate Chemical Co.	Maryland.....	Shipment of adulterated and misbranded laudanum.....	Information filed; pending.
1652	J. L. Stephens Co.	Ohio, southern district.	Shipment of misbranded drug-habit cure from Ohio to the District of Columbia.	Do.
1653	.....do.....	.....do.....	.....do.....	Do.
1658	Allaire, Woodward & Co.	Illinois, southern district.	Shipment of adulterated and misbranded powdered colocyth from Illinois to Virginia.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1012.)
1659	The Tilden Co.	New York, southern district.	Shipment of misbranded drug from New York to Virginia.	Defendant pleaded guilty; fined \$150. (Notice of Judgment No. 780.)
1660	Semrad Chemical Co.	Illinois, northern district.	Shipment of adulterated and misbranded flavoring extracts from Illinois to Michigan.	Defendant pleaded guilty; fined \$100 and costs. (Notice of Judgment No. 661.)
1661	E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded liqueur from California to Arizona.	Defendant pleaded guilty; fined \$25. (Notice of Judgment 1247.)
1665	Chandler Medicine Co.	Missouri, eastern district.	Shipment of misbranded headache bitters from Missouri to Kentucky.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 831.)
1666	Iowa Butter & Egg Co.	Iowa, southern district.	Shipment of adulterated frozen eggs from Iowa to New York.	Defendant pleaded guilty; fined \$50.
1667	Samuel Smith & Co.	Illinois, northern district.	Shipment of adulterated and misbranded Tok-ola flavor from Illinois to the District of Columbia.	Information filed; pending.
1668	Murray & Nickell Manufacturing Co.	.....do.....	Shipment of adulterated and misbranded drug product from Illinois to California.	Do.
1669	Farrington & Whittney.	New York, southern district.	Shipment of misbranded olive oil from New York to Texas.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 751.)
1670	Mound City Extract Co.	Missouri, eastern district.	Shipment of adulterated and misbranded cola sirup from Missouri to Illinois.	Defendant pleaded guilty; fined \$50 and costs. (Notice of Judgment No. 731.)
1671	Warren D. Tallman...	New York, northern district.	Shipment of misbranded "German headache powder" from New York to Louisiana.	Defendant pleaded guilty; fined \$25.

1672	McCormick & Co.....	Maryland.....	Shipment of misbranded paprika from Maryland to Pennsylvania.	Defendant pleaded <i>nolo contendere</i> ; fined 50 cents. (Notice of Judgment No. 1153.) Information filed; pending.
1673	Murray & Nickell Manufacturing Co.....	Illinois, northern district.	Shipment of adulterated and misbranded drug powdered belladonna leaves from Illinois to California.	Do.
1674	Hynes Bros. Co.....	New York, southern district.	Shipment of adulterated and misbranded oil sweet orange from New York to Massachusetts.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 677.)
1675	Young Bros. (Inc.)....	Washington, western district.	Shipment of misbranded coffee from Washington to Idaho.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 897.)
1676	Chas. G. Sumners Co.	Maryland.....	Shipment of misbranded pork and beans from Maryland to Pennsylvania.	Information filed; pending.
1681	Amazon Vinegar & Pickling Works.	Iowa, southern district.	Shipment of adulterated and misbranded vinegar from Iowa to Illinois.	Indictment filed; motion to quash pending.
1682	Pacific Coast Syrup Co.	California, northern district.	Shipment of adulterated jelly from California to Nevada.	Information filed; pending.
1683	C. H. Weaver & Co....	Illinois, northern district.	Shipment of adulterated evaporated eggs from Illinois to New York.	Information filed; pending.
1684	Schlesinger & Bender.	California, northern district.	Shipment of adulterated and misbranded apricot brandy from California to Arizona.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1247.)
1685	Bettman, Johnson Co.	Ohio, southern district.	Shipment of misbranded champagne from Ohio to Missouri.	Information filed; pending.
1686	Warner-Jenkinson Co.	Missouri.....	Shipment of adulterated and misbranded lemon extract from Missouri to Michigan.	Defendant pleaded guilty to misbranding; fined \$10 and costs. (Notice of Judgment No. 733.)
1687	Crandall Petlee Co....	New York, southern district.	Shipment of adulterated eggs from New York to Virginia.	Defendant pleaded guilty and fined \$25. (Notice of Judgment No. 682.)
1688	Fendleton Grain Co....	Missouri, eastern district.	Shipment of adulterated and misbranded oats from Missouri to Louisiana.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 759.)
1689	.....do.....	.....do.....	.....do.....	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 748.)
1692	Phillips Medical Co....	Nebraska.....	Shipment of misbranded face lotion from Nebraska to Colorado.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 862.)
1693	Hudson Manufacturing Co.	Illinois, northern district.	Shipment of adulterated and misbranded vanilla extract from Illinois to Texas.	Information filed; pending.
1695	Seio Condensed Milk Co.	Oregon.....	Shipment of adulterated condensed milk from Oregon to Washington.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 845.)
1696	Walkers Tonic Co.....	Kentucky, western district.	Shipment of misbranded drug tonic from Kentucky to Tennessee.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 982.)
1697	National Bakers Egg Co.	New York, southern district.	Shipment of adulterated egg product from New York to Rhode Island.	Information filed; court instructed jury to return verdict of not guilty for defendant. (Notice of Judgment No. 1118.)
1703	Wisconsin Creamery Co.	Missouri, eastern district.	Shipment of adulterated and misbranded butter from Missouri to Illinois.	Defendant entered plea of guilty; fined \$25 and costs.
1704	Wichita Vinegar Works.	Kansas.....	Shipment of misbranded jelly from Kansas to Oklahoma.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 730.)
1705	Shopard Baking Powder Co.	Missouri, eastern district.	Shipment of adulterated and misbranded vanilla extract from Missouri to Kentucky.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 749.)
1707	Fendleton Grain Co....	.....do.....	Shipment of adulterated and misbranded oats from Missouri to Louisiana.	Defendant pleaded guilty; fined \$20. (Notice of Judgment No. 1121.)
1709	Marshalltown Syrup & Sugar Co.	Iowa, southern district.	Shipment of misbranded sugar butter from Iowa to Texas.	Defendant pleaded <i>nolo contendere</i> ; fined \$200 and costs. (Notice of Judgment No. 839.)
1710	Imperial Cordial Co....	Illinois, northern district.	Shipment of adulterated and misbranded bitters from Illinois to Minnesota.	Fined \$50. (Notice of Judgment 1168.)
1711	Wieland Bros.....	California, northern district.	Shipment of misbranded cheese from California to Nevada.	Fined \$50. (Notice of Judgment 1169.)
1713	.....do.....	.....do.....	.....do.....	

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1714	H. L. Humphrey.....	Ohio, northern district.	Shipment of misbranded headache powders from Ohio to Michigan.	Information filed; pending.
1715	Oil Importing Co.....	.....do.....	Shipment of adulterated and misbranded olive oil from Ohio to Missouri.	Do.
1716	S. J. Van Lill Co.....	Maryland.....	Shipment of misbranded preserves from Maryland to New York.	Do.
1717	Norton & Curd Coffee Co.	Kentucky, western district.	Shipment of misbranded coffee from Kentucky to Tennessee.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 951.)
1719	St. Louis Crystal Egg Co.	Missouri, eastern district.	Shipment of adulterated crystal egg from Missouri to Massachusetts.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1100.)
1720	Bettman-Johnson Co.	Ohio, southern district.	Shipment of misbranded wine from Ohio to Illinois.....	Information filed; pending.
1721	Allen B. Wrisley Co.	Illinois, northern district.	Shipment of adulterated and misbranded lemon and vanilla flavors from Illinois to Minnesota.	Defendant pleaded guilty; fined \$100 and costs. (Notice of Judgment No. 662.)
1722	Barrett & Barrett.....	.....do.....	Shipment of adulterated and misbranded cider vinegar from Illinois to Wisconsin.	Defendant pleaded guilty; fined \$100 and costs. (Notice of Judgment No. 690.)
1723	Hanley & Kinsella Coffee & Spice Co.	Missouri, eastern district.	Shipment of adulterated cayenne pepper from Missouri to Mississippi.	Defendant pleaded nolo contendere; fined \$10. (Notice of Judgment No. 1013.)
1726	Henry H. Ottens Manufacturing Co.	Pennsylvania, eastern district.	Shipment of misbranded egg nutrine from Pennsylvania to New York.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 991.)
1728	Aschanbach & Miller.....	.....do.....	Shipment of misbranded drug from Pennsylvania to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 883.)
1731	Anderson Canning Co.	Iowa, southern district.	Shipment of adulterated and misbranded tomato catsup from Iowa to Missouri.	Defendant pleaded guilty; fined \$200 and costs. (Notice of Judgment No. 1004.)
1732	A. Fiore & Co.....	New York, southern district.	Shipment of adulterated olive oil from New York to New Jersey.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 706.)
1733	Allen B. Wrisley Co.	Illinois, northern district.	Shipment of adulterated and misbranded lemon flavor from Illinois to Maine.	Defendant pleaded guilty; fined \$100 and costs. (Notice of Judgment No. 690.)
1734	Independent Distilling Co.	Missouri, western district.	Shipment of adulterated and misbranded brandy from Missouri to Kansas.	Defendant pleaded guilty; fined \$400 and costs. (Notice of Judgment No. 858.)
1736	Riche Co.....	New York, eastern district.	Shipment of misbranded drug product from New York to the District of Columbia.	Information filed; demurrer filed overruled; pending.
1742	S. Gumpert & Co.....	New York, southern district.	Shipment of misbranded vanilla extract from New York to Texas.	Defendant convicted; fined \$400. (Notice of Judgment No. 806; consolidated with F. & D. Nos. 1344, 1416, and 1841.)
1743	New Wooster Preserving Co.	Ohio, northern district.	Shipment of adulterated catsup from Ohio to Michigan.....	Information filed; pending.
1744	Schlesinger & Bender.	California, northern district.	Shipment of misbranded drug from California to the District of Columbia.	Defendant pleaded guilty; fined \$25.
1745	Arturo Marchesini.....	Illinois, northern district.	Shipment of adulterated and misbranded olive oil from Illinois to Wisconsin.	Verdict of guilty; fined \$10 and costs. (Notice of Judgment No. 915.)
1747	Edward S. Sinclair.....	District of Columbia...	Adulterated egg noodles offered for sale in the District of Columbia.	Pleaded guilty; fined \$15. (Notice of Judgment No. 734.)

1748	New Blue Grass Canning Co.	Kentucky, western district.	Shipment of adulterated and misbranded tomato purée from Kentucky to Louisiana.	Defendant pleaded guilty; fined \$25
1749	Independent Distilling Co.	Missouri, western district.	Shipment of adulterated and misbranded blackberry cordial from Missouri to Kansas.	Defendant pleaded guilty; consolidated with F. & D. No. 1734, fined \$400 and costs. (Notice of Judgment No. 858.)
1750	Consumers Supply Co.	.....do.....	.....do.....	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 926.)
1755	R. Hartesty Manufacturing Co.	Colorado.....	Shipment of adulterated and misbranded oleo-de-vanil from Colorado to Texas.	Information filed; pending.
1757	Jordan Co.	Massachusetts.....	Shipment of misbranded drug from Massachusetts to Connecticut.	Defendant pleaded guilty; information placed on file. (Notice of Judgment No. 860.)
1758	Psaki Bros.	New York, southern district.	Shipment of adulterated olives from New York to Pennsylvania.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 818.)
1761	New Blue Grass Canning Co.	Kentucky, western district.	Shipment of adulterated tomato pulp from Kentucky to Louisiana.	Defendant pleaded guilty; fined \$25.
1762	Muscaine French Cheese Co.	Iowa, southern district.	Shipment of misbranded cheese from Iowa to Texas.	Jury returned verdict in favor of defendant.
1763	R. Smithson	Illinois, northern district.	Shipment of adulterated frozen egg from Illinois to New York.	Information filed; pending.
1766	Dannemiller Coffee Co.	New York, eastern district.	Shipment of adulterated and misbranded coffee from New York to Tennessee.	Defendant pleaded guilty to adulteration; fined \$55. Misbranding count pending.
1767	Beard, Armstrong & Co.	Virginia, eastern district.	Shipment of adulterated and misbranded vinegar from Virginia to Colorado.	Information filed; pending.
1773	Beck Cereal Co.	Michigan, eastern district.	Shipment of misbranded stock feed from Michigan to Virginia.	Defendant pleaded nolo contendere; fined \$1. Notice of Judgment No. 809.)
1774	.....do.....	.....do.....	Shipment of misbranded cattle feed from Michigan to Virginia.	Do.
1777	National Pickle & Canning Co.	Missouri, eastern district.	Shipment of adulterated and misbranded jam from Missouri to Texas.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 1097.)
1778	F. A. Stuart Co.	Michigan, eastern district.	Shipment of misbranded catarrh tablets from Michigan to New York.	Defendant pleaded nolo contendere; fined \$10. (Notice of Judgment No. 718.)
1780	Lexington Drug & Chemical Co.	New York, southern district.	Shipment of misbranded drug-habit cure from New York to Missouri.	Information filed; pending.
1782	Frank Crawford	.....do.....	Shipment of adulterated lard butter from New York to Massachusetts.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 836.)
1783	Cochran & McCalland.	Ohio, southern district.	Shipment of misbranded asthma cure from Ohio to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 837.)
1786	Rogers Drug Co.	Texas, northern district.	Shipment of misbranded drug from Texas to Tennessee.	Information filed; pending.
1787	Harbauer-Marlean Co.	Ohio, northern district.	Shipment of misbranded apple butter from Ohio to New York.	Do.
1790	Mississippi Cotton Oil Co.	Mississippi, northern district.	Shipment of misbranded cottonseed meal from Mississippi to Vermont.	Do.
1792	Brokaw Merchandise Co.	Missouri, eastern district.	Shipment of misbranded coffee from Missouri to Illinois.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1014.)
1793	.....do.....	.....do.....	Shipment of adulterated and misbranded maple sugar from Missouri to Illinois.	Defendant pleaded guilty; fined \$20; nolle prosequi entered as to adulteration. (Notice of Judgment No. 1015.)
1802	Huntington Maple Syrup & Sugar Co.	Rhode Island.....	Shipment of adulterated and misbranded maple sirup from Rhode Island to Georgia.	Information filed; pending.
1805	Duroy & Haines Co.	Ohio, northern district.	Shipment of misbranded grape juice from Ohio to Tennessee.	Defendant pleaded; nolo contendere; fined \$25 and costs. (Notice of Judgment 1283.)
1806	Shepard Pharmaceutical Co.	New York, southern district.	Shipment of misbranded drug from New York to the District of Columbia.	Information filed; pending.

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1807	Murray & Nickell Manufacturing Co.	Illinois, northern district.	Shipment of misbranded drug from Illinois to California...	Information filed; pending.
1810	International Chemical Co.	New Jersey.....	Shipment of misbranded drug from New Jersey to Massachusetts.	Defendant pleaded non vult; fined \$25. (Notice of Judgment No. 942.)
1813	Ghiradelli Co.....	California, northern district.	Shipment of misbranded chocolate from California to Nevada.	Indictment filed; defendant's demurrer overruled; pending.
1817	Fleischmann-Clark & Co.	do.....	Shipment of adulterated and misbranded peppermint from California to Nevada.	Pleaded guilty; fined \$5. (Notice of Judgment 1238.)
1818	Stelson-Barrett Co....	California, southern district.	Shipment of adulterated jam from California to Arizona...	Defendant pleaded guilty; fined \$1. (Notice of Judgment No. 716.)
1824	Edward Weston Tea & Spice Co.	Missouri, eastern district.	Shipment of adulterated and misbranded vanilla extract from Missouri to New Mexico.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1096.)
1825	Paris Medicine Co.....	do.....	Shipment of misbranded drug from Missouri to Tennessee.	Information nolle prossed.
1826	C. J. Moffett Medicine Co.	do.....	do.....	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1019.)
1827	David B. Levy.....	New York, southern district.	Shipment of adulterated and misbranded drug from New York to the District of Columbia.	Information filed; pending.
1828	Lehn & Fink.....	do.....	Shipment of adulterated and misbranded drug from New York to California.	Information filed; demurrer overruled; nolle prossed.
1829	Consumers Supply Co..	Missouri, western district.	Shipment of adulterated and misbranded blackberry cordial from Missouri to Kansas (two consignments).	Defendant pleaded guilty; fined \$100 in each case. (Notice of Judgment No. 926.)
1830	Bennett Medicine Co..	Virginia, eastern district.	Shipment of misbranded drug from Virginia to the District of Columbia.	Information filed; pending.
1834	Charles Crompton & Sons	Massachusetts.....	Shipment of misbranded flavoring extracts from Massachusetts to New Hampshire.	Defendant convicted; fined \$80. (Notice of Judgment No. 1029.)
1836	Metropolitan Tartar Co.	New Jersey.....	Shipment of adulterated and misbranded strawberry fruit flavor from New Jersey to New York.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 892.)
1837	Radio-Sulpho Co.....	Colorado.....	Shipment of misbranded drug from Colorado to the District of Columbia.	Verdict for Government; motion for new trial pending.
1838	Metropolitan Tartar Co.	New Jersey.....	Shipment of adulterated and misbranded raspberry sirup from New Jersey to New York.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 892.)
1839	J. M. Nathan.....	Michigan, western district.	Shipment of misbranded sirup from Michigan to Wisconsin.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 793.)
1841	S. Gumpert & Co.....	New York, southern district.	Shipment of misbranded vanilla extract from New York to Texas.	Verdict of guilty; defendant fined \$400. (Notice of Judgment No. 806; consolidated with F. & D. Nos. 1344, 1416, 1742.)
1843	E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded orange curacao from California to Washington.	Defendant pleaded guilty; fined \$25. (Notice of Judgment 1247.)
1844	Jacob Kreischer.....	New York, northern district.	Shipment of misbranded candy from New York to Pennsylvania.	Grand jury failed to indict.
1845	American Preserve Co.	Pennsylvania, eastern district.	Shipment of misbranded apple butter from Pennsylvania to New York.	Nolle prossed.
1846	Acme Mills Co.....	Oregon.....	Shipment of misbranded bran from Oregon to Washington.	Information filed; pending.

1850	Cook & Bernheimer Co.	New York, southern district.	Shipment of adulterated and misbranded peppermint extract from New York to Colorado.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 775.)
1851	Coroneos Bros.	Pennsylvania, eastern district.	Shipment of adulterated and misbranded olive oil from Pennsylvania to Georgia.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 997.)
1852	Rogers-Fyatt Shellac Co.	Illinois, northern district.	Shipment of adulterated confectioner's brown glaze from Illinois to Missouri.	Defendant pleaded guilty; fined \$50 and costs. (Notice of Judgment No. 964.)
1856	Waldon Drug Store	Texas, eastern district.	Shipment of misbranded cold and gripe tablets from Texas to Georgia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 769.)
1859	Wheeler Chemical Works.	Illinois, northern district.	Shipment of misbranded drug product from Illinois to Michigan.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 795.)
1864	Peck & Velsor	New York, southern district.	Shipment of adulterated and misbranded ground turneric, belladonna leaves, senna alex. leaves from New York to California.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 871.)
1865	Smith Bros.	Louisiana, eastern district.	Shipment of adulterated and misbranded coffee from Louisiana to Mississippi.	Information filed; pending.
1866	Hudson Manufacturing Co.	Illinois, northern district.	Shipment of adulterated and misbranded vanilla extract from Illinois to Texas.	Do.
1872	Marshalltown Syrup & Sugar Co.	Iowa, southern district.	Shipment of misbranded sugar butter from Iowa to Missouri.	Defendant pleaded guilty; fined \$20. (Notice of Judgment No. 1122.)
1873	A. Finke's Widow	California, northern district.	Shipment of misbranded champagne from California to New Mexico.	Indictment returned; pending.
1874	Lexington Drug & Chemical Co.	New York, southern district.	Shipment of misbranded drug habit cure from New York to New Jersey.	Information filed; pending.
1875	Emmert Proprietary Co.	Illinois, northern district.	Shipment of misbranded teething sirup from Illinois to Michigan.	Nolle prossed.
1876	Mayor Walnut Oil Co.	Missouri, western district.	Shipment of misbranded drug product from Missouri to Washington.	Information filed; pending.
1877	Indian Tar Balsam Co.	Maryland.	Shipment of misbranded tar balsam from Maryland to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 898.)
1878	Peroxide Specialty Co.	Ohio, southern district.	Shipment of misbranded peroxide cream from Ohio to Indiana.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 840.)
1882	California Fruit Canners' Association.	California, northern district.	Shipment of adulterated grape jam from California to ———.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1249.)
1883	Ruge Bros. Canning Co.	Florida, northern district.	Shipment of misbranded oysters from Florida to Kentucky.	No service obtained on defendant.
1884	Willis H. Lowe Co.	Massachusetts.	Shipment of misbranded headache wafers from Massachusetts to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 820.)
1891	Globe Biscuit Specialty Works.	Maryland.	Shipment of adulterated ice cream cones from Maryland to Illinois.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 899.)
1892	do.	do.	do.	Do.
1893	J. A. E. Garvin	Massachusetts.	Shipment of misbranded aniseed sirup from Massachusetts to Rhode Island.	Defendant pleaded guilty; fined \$150. (Notice of Judgment No. 773.)
1894	B. T. Chandler & Son.	Illinois, northern district.	Shipment of misbranded cider vinegar from Illinois to Wisconsin.	Information filed; pending.
1897	Standard Syrup Co.	Ohio, northern district.	Shipment of adulterated and misbranded maple sugar from Ohio to Michigan.	Do.
1898	Steelman & Archer.	Pennsylvania, eastern district.	Shipment of adulterated and misbranded orange flavor from Pennsylvania to New Jersey.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 861.)
1899	Peck & Velsor	New York, southern district.	Shipment of adulterated and misbranded "ground turneric, belladonna leaves, senna alex. leaves" from New York to California.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 871.)
1900	Manhattan Importing Co.	Ohio, northern district.	Shipment of adulterated lemon oil from Ohio to Pennsylvania.	Information filed; pending.

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1902	National Pickle & Canning Co.	Missouri, eastern district.	Shipment of adulterated catsup from Missouri to Arkansas.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 1098.)
1904	Kellum Remedy Co.	Virginia, eastern district.	Shipment of misbranded drug, dyspepsia cure, from Virginia to the District of Columbia.	Information filed; pending.
1905	R. W. Davis Drug Co.	Illinois, northern district.	Shipment of misbranded bitters from Illinois to Missouri.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 735.)
1906	Peek & Velsor.	New York, southern district.	Shipment of adulterated and misbranded "ground turmeric, belladonna leaves, senna alex. leaves" from New York to California.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 871.)
1907	Stewart, Knatz & Co.	Maryland.	Shipment of misbranded coffee from Maryland to Delaware.	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 896.)
1909	Clarendon Mineral Springs Co.	Vermont.	Shipment of misbranded water from Vermont to New York.	Information filed; pending.
1910	Acme Mills Co.	Oregon.	Shipment of misbranded diabetie flour from Oregon to Idaho.	Verdict for Government; motion for new trial pending.
1911	Union Vinegar Co.	Ohio, southern district.	Shipment of adulterated and misbranded vinegar from Ohio to Kentucky.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 844.)
1913	A. Repsold & Co.	California, northern district.	Shipment of misbranded wine from California to Ohio.	Grand jury failed to indict.
1914	Ripin & Co.	New York, southern district.	Shipment of misbranded wine from New York to Indiana.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 828.)
1915	C. A. Lewis.	Massachusetts.	Shipment of misbranded drug from Massachusetts to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 750.)
1916	Colorado Sanitarium Food Co.	Colorado.	Shipment of diabetie meal from Colorado to Utah.	Information filed; pending.
1917	W. K. Jahn Co.	Illinois, northern district.	Shipment of adulterated powdered egg albumen from Illinois to Missouri.	Do.
1919	Mount Pickle Co.	Utah.	Shipment of misbranded mustard from Utah to Montana.	Demurrer to the information sustained; pending.
1920	R. Hillier's Sons Co.	New Jersey.	Shipment of adulterated and misbranded cathartics from New Jersey to California.	Information filed; pending.
1921	Forbes Bros. Tea & Spice Co.	Missouri, eastern district.	Shipment of adulterated and misbranded vanilla flavor from Missouri to Texas.	Nolle prossed.
1922	Eddy & Eddy Manufacturing Co.	do.	Shipment of adulterated and misbranded vanilla extract and adulterated pepper from Missouri to Oklahoma.	Jury returned verdict for Government on count charging adulteration of pepper. Motion for a new trial and in arrest of judgment pending; jury failed to agree as to vanilla extract; pending. (Notice of Judgment No. 1118.)
1923	American Soda Fountain Co.	Massachusetts.	Shipment of adulterated and misbranded lemon, orange, and vanilla extracts from Massachusetts to Georgia.	Information filed; pending.
1924	Ripen & Co.	New York, southern district.	Shipment of adulterated and misbranded champagne from New York to Kentucky.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 828.)
1925	Henry Regel.	Indiana.	Shipment of adulterated milk from Indiana to Ohio.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1092.)
1926	Crist Krause.	do.	do.	Defendant pleaded not guilty; pending.

1927	J. W. Shorten.....	.....do.....	Two indictments returned; defendant pleaded guilty to one and fined \$25; other indictment nolle prossed. (Notice of Judgment No. 1129.)
1928	American Granule & Tablet Co.	Ohio, southern district.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 843.)
1930	Maple Tree Sugar Co....	Vermont.....	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1164.)
1932	E. R. Rownds.....	Indiana.....	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 1130.)
1933	Libby, McNeil & Libby.	Illinois, northern district.	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 764.)
1935	Wm. McMurray & Co....	Minnesota.....	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 966.)
1938	Charles L. Heinle Specialty Co.	Pennsylvania, eastern district.	Information filed; pending.
1939	Bettman-Johnson Co....	Ohio, southern district.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1117.)
1940	Romero Drug Co.....	New Mexico.....	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 1076.)
1941	Wm. McMurray & Co....	Minnesota.....	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 764.)
1945	Smith's Quinets Co....	Pennsylvania, eastern district.	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 965.)
1946	A. E. Johnson, Jr.....	West Virginia, southern district.	Defendant pleaded nolo contendere; fined \$10 and costs. (Notice of Judgment No. 1214.)
1948	Bettman-Johnson Co....	Ohio, southern district.	Information filed; pending.
1949	Price Compound Co....	Minnesota.....	Do.
1951	Kickapoo Indian Medicine Co.	Connecticut.....	Defendant pleaded nolo contendere; fined \$25 and costs. (Notice of Judgment No. 823.)
1952	Van Vleet Mansfield Drug Co.	Tennessee, western district.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1113.)
1953	E. G. Lyons & Raas Co.	California, northern district.	Indictment returned; pending.
1955	Long Syrup Refining Co.	.....do.....	No indictment returned.
1956	Lord-Mott Co.....	Maryland.....	Defendant pleaded guilty; fined \$20. (Notice of Judgment No. 900.)
1957	Great Atlantic & Pacific Tea Co.	New Jersey.....	Defendant pleaded non vult; fined \$50. (Notice of Judgment No. 1066.)
1958	H. W. Elders.....	Missouri, western district.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 930.)
1962	Thomson & Taylor Spice Co.	Illinois, northern district.	Information filed; pending.
1964	A. Blum, Jr.'s Sons....	New York, southern district.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 771.)
1965	Psaki Bros.....	.....do.....	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 818.)
1969	Thomas M. Curtius....	.....do.....	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 888.)
1970	Long Syrup Refining Co.	California, northern district.	No indictment returned.

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1971	Lehn & Fink.....	New York, southern district.	Shipment of adulterated and misbranded drug, turmeric, from New York to Virginia.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 996.)
1972	E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded orange curacao from California to Utah.	Indictment returned; pending.
1973	Coroneos Bros.....	Pennsylvania, eastern district.	Shipment of misbranded macaroni from Pennsylvania to Georgia.	Defendant pleaded guilty; fined \$25 and costs.
1975	Thomson & Taylor Spice Co.	Illinois, northern district.	Shipment of misbranded coffee from Illinois to Colorado...	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 841.)
1976	A. Blum, jr.'s Sons...	New York, southern district.	Shipment of misbranded gin from New York to New Jersey.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 770.)
1978	Maas Baking Co.....	do	Shipment of misbranded egg noodles from New York to New Jersey.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1181.)
1988	J. T. Polk Co.....	Indiana	Shipment of adulterated ketchup from Indiana to Iowa...	Defendant pleaded guilty; fined \$200. (Consolidated with F. & D. No. 2248.)
1991	Standard Syrup Co....	Ohio, northern district.	Shipment of adulterated and misbranded sugar from Ohio to Michigan.	Do.
1994	Kansas City Conserve Co.	Missouri, western district.	Shipment of adulterated and misbranded tomato ketchup from Missouri to Oklahoma.	Defendant pleaded guilty; fined \$10.
1996	Star Well Co.....	Texas, northern district.	Shipment of misbranded water from Texas to Louisiana...	Indictment returned; pending.
1997	E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded crème de menthe from California to Arizona.	Do.
1998	do.....	do	Shipment of misbranded Jamaica rum from California to Colorado.	Information filed; pending.
1999	Joseph P. Wilde.....	Pennsylvania, eastern district.	Shipment of misbranded mustard from Pennsylvania to New Jersey.	Do.
2001	Glessner Medicine Co..	Ohio, northern district	Shipment of misbranded croup remedy from Ohio to Pennsylvania.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 768.)
2005	Ketchum & Co.....	New York, southern district.	Shipment of adulterated and misbranded lemon extract from New York to New Jersey.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 986.)
2006	Capital Pharmacy.....	Texas, southern district.	Shipment of misbranded headache tablets from Texas to Tennessee.	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 988.)
2008	Mrs. J. F. Marshall Smith.	Minnesota.....	Shipment of misbranded cough cure, "Humburg Oil," from Minnesota to Utah.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 872.)
2011	W. M. Spencer & Son.	Ohio, southern district.	Shipment of misbranded jelly from Ohio to Kentucky....	Information filed; pending.
2013	A. Finke's Widow....	California, northern district.	Shipment of adulterated and misbranded champagne from California to Arizona.	Do.
2014	Peek & Velsor.....	New York, southern district.	Shipment of adulterated and misbranded coco bark from New York to Illinois.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1109.)
2015	J. Lindsay Wells Co....	Tennessee, western district.	Shipment of adulterated and misbranded cottonseed meal from Tennessee to Pennsylvania.	

2020	Corn Products Refining Co.	Illinois, northern district.	Shipment of adulterated and misbranded sorghum from Illinois to Minnesota.	Information filed; pending.
2021	Septicide Co.	Wisconsin, eastern district.	Shipment of misbranded drug from Wisconsin to the District of Columbia.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 907.)
2024	Hudson Manufacturing Co.	Illinois, northern district.	Shipment of adulterated and misbranded vanilla extract from Illinois to Texas.	Information filed; pending.
2026	E. J. Abel Co.	.....do.....	Shipment of misbranded "antispasmodic" from Illinois to Pennsylvania.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 903.)
2027	Hyman Pickle Co.	Kentucky, western district.	Shipment of adulterated catsup from Kentucky to Oklahoma.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 950.)
2028	J. W. Brandt Co. (Ltd.)	Michigan, eastern district.	Shipment of misbranded soothing balm from Michigan to Pennsylvania.	Defendant pleaded nolo contendere; fined \$10. (Notice of Judgment No. 777.)
2031	Moxley Lemon Elixir Co.	Georgia, northern district.	Shipment of misbranded drug, lemon elixir, from Georgia to the District of Columbia.	Information filed; pending.
2033	Pioneer Preserving Co.	Missouri, western district.	Shipment of misbranded jam from Missouri to Kansas.	Do.
2035	Ontario Chemical Co.	New York, northern district.	Shipment of misbranded drug, "cholerol" from New York to Massachusetts.	Do.
2036	Marchesini Bros.	New York, southern district.	Shipment of misbranded olive oil from New York to New Jersey.	Verdict for defendant. (Notice of Judgment No. 916.)
2037	John Vittucci Co.	Washington, western district.	Shipment of adulterated and misbranded salad oil from Washington to Idaho.	Information filed; pending.
2038	Italian Importing Co.	New York, southern district.	Shipment of misbranded drug "Fernet Milano" from New York to Washington.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1182.)
2040	Marchesini Bros.	.....do.....	Shipment of adulterated and misbranded olive oil from New York to New Jersey.	Verdict for defendant. (Notice of Judgment No. 916.)
2049	Star Wafer Co.	Oklahoma, western district.	Shipment of adulterated ice-cream cones from Oklahoma to Nebraska.	Information filed; pending.
2050	.....do.....	.....do.....	Shipment of adulterated ice-cream cones from Oklahoma to Texas.	Do.
2054	Pioneer Preserving Co.	Missouri, western district.	Shipment of misbranded jam from Missouri to Kansas.	Do.
2056	Huber & Fuhrman Drug Mills.	Wisconsin, eastern district.	Shipment of adulterated and misbranded drug "Alexandria semina" from Wisconsin to California.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1010.)
2057	Alabama-Georgia Syrup Co.	Alabama, middle district.	Shipment of misbranded sirup from Alabama to Mississippi.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 882.)
2060	Pan-American Manufacturing Co.	Louisiana, eastern district.	Shipment of adulterated and misbranded vanilla flavor from Louisiana to New Mexico.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1158.)
2064	Wood & Selick.	New York, southern district.	Shipment of adulterated almond pastio from New York to Michigan.	Nolle prossed.
2066	R. H. Kline.	New Jersey.....	Shipment of misbranded nerve restorer from New Jersey to the District of Columbia.	Defendant pleaded non vult; sentence suspended. (Notice of Judgment No. 1070.)
2068	Dry Manufacturing Co.	Ohio, northern district.	Shipment of misbranded essence of coffee from Ohio to Pennsylvania.	Information filed; pending.
2069	New Blue Grass Canning Co.	Kentucky, western district.	Shipment of adulterated catsup from Kentucky to Georgia.	Defended pleaded guilty; fined \$25.
2071	B. T. Chandler & Son.	Illinois, northern district.	Shipment of adulterated and misbranded vinegar from Illinois to Indiana.	Information filed; pending.
2072	J. A. McCormack & Co.	Tennessee, western district.	Shipment of misbranded drug from Tennessee to Arkansas.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1111.)
2073	C. H. Weaver & Co.	Illinois, northern district.	Shipment of adulterated evaporated eggs from Illinois to New York.	Information filed; pending.

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
2075	Norman Lichty Manufacturing Co.	Iowa, southern district.	Shipment of misbranded headache capsules from Iowa to Michigan.	Information filed; pending.
2076	Clinton Drug Co.	New Jersey	Shipment of misbranded headache powders from New Jersey to New York.	Do.
2080	William J. Wood	..... do	Shipment of adulterated soothing sirup from New Jersey to Pennsylvania.	Defendant pleaded non vult; sentence suspended.
2083	Oakland Vinegar & Pickle Co.	Michigan, eastern district.	Shipment of adulterated and misbranded vinegar from Michigan to Wisconsin.	Defendant pleaded nolo contendere; fined \$2. (Notice of Judgment No. 985.)
2095	Spieelman Bros. Co.	Illinois, northern district.	Shipment of adulterated vinegar from Illinois to Iowa.	Information filed; pending.
2096	Rex Extract Co.	New York, eastern district.	Shipment of misbranded vanilla bean sugar from New York to Massachusetts.	Do.
2098	Rosenblatt Co.	California, northern district.	Shipment of adulterated and misbranded essence of peppermint from California to Texas.	Do.
2100	Wood & Selick	New York, southern district.	Shipment of adulterated egg color from New York to Louisiana.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1103.)
2106	Jas. H. Forbes Tea & Coffee Co.	Missouri, eastern district.	Shipment of misbranded flavoring and cake color from Missouri to Wyoming.	Defendant pleaded guilty; fined \$32 and costs. (Notice of Judgment No. 1057.)
2109	Hynes Bros. Co.	New York, southern district.	Shipment of adulterated and misbranded oil of lemon from New York to Texas.	Do.
2111	Mihalovitch Co.	Ohio, southern district.	Shipment of misbranded "gold medal coffee cocktail" from Ohio to Colorado.	Do.
2112	Clark, Coggin & Johnson Co.	Massachusetts	Shipment of misbranded coffee from Massachusetts to Wisconsin.	Do.
2114	De Boer & Dick	Illinois, northern district.	Shipment of adulterated wafers from Illinois to Pennsylvania.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1039.)
2115	John D. Park & Sons Co.	Ohio, southern district.	Shipment of misbranded drug product from Ohio to Pennsylvania.	Information filed; nolle prossed.
2116	Valvona Marchiony Co.	New York, eastern district.	Shipment of adulterated ice-cream cones from New York to Oklahoma.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 940.)
2117	..... do .....	..... do	Shipment of adulterated ice-cream cones from New York to Pennsylvania.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 969.)
2118	Behle Bros.	Wisconsin, eastern district.	Shipment of misbranded cheese from Wisconsin to Missouri.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 876.)
2119	Max Gessler	..... do	Shipment of misbranded headache wafers from Wisconsin to Massachusetts.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 1051.)
2122	Van Camp Packing Co.	Illinois, eastern district.	Shipment of misbranded cream from Illinois to Texas.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1211.)
2123	Dr. I. A. Detchon	Indiana	Shipment of misbranded rheumatism remedy from Indiana to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1091.)
2125	Tip Top Bottling Co.	Missouri, eastern district.	Shipment of adulterated and misbranded sweet cider from Missouri to Illinois.	Defendant pleaded guilty; fined \$500. (Notice of Judgment No. 1091.)

2126	Teasdale Fruit & Nut Products Co.	Arkansas, western district.	Shipment of misbranded evaporated apples from Arkansas to Texas.	Defendant pleaded guilty; fined \$10 and costs.
2127	G. H. Lowell Co.....	New York, southern district.	Shipment of adulterated and misbranded vanilla extract from New York to Iowa.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 889.)
2128	F. L. Kidder & Co.....	Illinois, eastern district.	Shipment of misbranded stock feed from Illinois to Indiana.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1176.)
2129	J. B. Edgar Grain Co....	Tennessee, western district.	Shipment of misbranded stock feed from Tennessee to Florida.	Information filed; pending.
2130	Spilopoulos & Costalupes.	California, northern district.	Shipment of misbranded spaghetti and macaroni from California to Washington.	Costalupes pleaded guilty; fined \$25.
2133	Hofman Bros. Produce Co.	Missouri, eastern district.	Shipment of misbranded evaporated apples from Missouri to Alabama.	Information filed; pending.
2134	Continental Cereal Co....	Illinois, southern district.	Shipment of misbranded gluten feed from Illinois to Indiana.	Do.
2140	The Country Club Egg Co.	Missouri, western district.	Shipment of adulterated eggs from Missouri to New York.	Grand jury failed to indict.
2141	Franklin Baker Co.....	Pennsylvania, eastern district.	Shipment of adulterated and misbranded coconut from Pennsylvania to Delaware.	Nolle prossed.
2144	Western Candy & Bakers Supply Co....	Missouri, eastern district.	Shipment of adulterated and misbranded pistachio extract from Missouri to Illinois.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 1041.)
2147	Rockhill & Victor.....	New York, southern district.	Shipment of adulterated drug, "oil of cassia," from New York to Massachusetts.	Information filed; pending.
2148	Acme Extract & Chemical Works.	Pennsylvania, middle district.	Shipment of adulterated vanilla extract from Pennsylvania to the District of Columbia.	Do.
2150	D. W. Hutchinson.....	New York, southern district.	Shipment of adulterated drug, oil of cassia, from New York to Massachusetts.	Do.
2151	Innis, Spelden & Co....	.....do.....	Shipment of adulterated drug, "oil of cassia," from New York to Massachusetts.	Do.
2155	St. Louis Crystal Egg Co.	Missouri, eastern district.	Shipment of adulterated eggs from Missouri to Minnesota.	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 1102.)
2156	Henry Thayer & Co....	Massachusetts.....	Shipment of misbranded drug from Massachusetts to New Jersey.	Information filed; pending.
2158	D. Malatesti & Co....	New York, southern district.	Shipment of adulterated and misbranded drug from New York to New Jersey.	Do.
2162	Star Wafer Co.....	Oklahoma.....	Shipment of adulterated ice-cream cones from Oklahoma to Texas.	Do.
2163	Christiani Drug Co....	District of Columbia..	Sale of adulterated and misbranded lemon extract in the District of Columbia.	Defendant pleaded guilty; fined \$280. (Notice of Judgment No. 1126.)
2164	Star Extract Works...	New York, southern district.	Shipment of adulterated yellow color from New York to Missouri.	Information filed; pending.
2175	Cuddy Cheese Co.....	Wisconsin, eastern district.	Shipment of misbranded cheese from Wisconsin to Maryland.	Defendant guilty; fined \$10. (Notice of Judgment No. 905.)
2177	Anderson Canning Co..	Iowa, southern district.	Shipment of adulterated and misbranded tomato catsup from Iowa to Missouri.	Defendant pleaded guilty; fined \$40 and costs. (Notice of Judgment No. 1004.)
2187	National Pickle & Canning Co.	Missouri, eastern district.	Shipment of misbranded strawberry ade from Missouri to Colorado.	Defendant pleaded guilty; fined \$20 and costs.
2188	St. Louis Syrup & Preserving Co.	.....do.....	Shipment of adulterated and misbranded "preserved peach, apple, and sugar" from Missouri to Iowa.	Defendant pleaded guilty; fined \$20. (Notice of Judgment No. 1038.)
2190	Granger Dairymen....	District of Columbia..	Adulterated oysters offered for sale in the District of Columbia.	Information filed; pending.
2191	A. G. Haynie.....	.....do.....	.....do.....	Do.
2192	Joseph F. Johnson.....	.....do.....	Sale of adulterated oysters in the District of Columbia.....	

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
2196	J. W. Furbush	District of Columbia	Sale of adulterated oysters in the District of Columbia.	Information filed; pending.
2199	Alart & McGuire	New York, southern district.	Shipment of adulterated tomato catsup from New York to Louisiana.	Defendant pleaded guilty; fined \$100. (Consolidated with F. & D. 1415; Notice of Judgment No. 921.)
2200	East St. Louis Cotton Oil Co.	Illinois, eastern district.	Shipment of misbranded cottonseed meal from Illinois to Michigan.	Information filed; pending.
2201	Wood & Selick	New York, southern district.	Shipment of adulterated fig jam from New York to Ohio.	Nolle prossed.
2207	J. Weller Co.	Ohio, southern district.	Shipment of adulterated catsup from Ohio to West Virginia.	Do.
2208	Peck & Velsor	New York, southern district.	Shipment of adulterated and misbranded colocynth apples from New York to California.	Do.
2209	H. A. Hayden	District of Columbia	Sale in the District of Columbia of adulterated oysters.	Information filed; pending.
2210	do.	do.	do.	Do.
2219	Anheuser Busch Brewing Co.	Illinois, eastern district.	Shipment of misbranded dried brewers' grains from Illinois to Pennsylvania.	Do.
2221	Lake Erie Wine Co.	Ohio, northern district.	Shipment of misbranded grape juice from Ohio to Michigan.	Do.
2224	W. P. Bernagozzi	New York, southern district.	Shipment of adulterated and misbranded tamarind sirup from New York to Missouri.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1082.)
2225	Youngstown Macaroni Co.	Ohio, northern district.	Shipment of misbranded macaroni from Ohio to Pennsylvania.	Information filed; pending.
2227	William H. Hayden	District of Columbia	Sale of adulterated oysters in the District of Columbia.	Do.
2233	Arrow Distillers Co.	Illinois, southern district.	Shipment of adulterated and misbranded tomato tonic from Illinois to Utah.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 999.)
2239	Schwabacher Bros. & Co.	Washington, western district.	Shipment of misbranded salad oil from Washington to Oregon.	Information filed; pending.
2240	Snell & Simpson	Massachusetts	Shipment of misbranded food product "figlettes" from Massachusetts to Rhode Island.	Do.
2241	National Fruits Products Co.	Tennessee, western district.	Shipment of misbranded cider from Tennessee to Missouri.	Do.
2244	W. J. Wilson & Son	Washington, eastern district.	Shipment of adulterated and misbranded cider vinegar from Washington to Idaho.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1119.)
2245	Minuet Cordial Co.	Missouri, western district.	Shipment of adulterated and misbranded Jamaica ginger from Missouri to Illinois.	Indictment filed; pending.
2246	Golden Gate Fruit Co.	New York, southern district.	Shipment of misbranded apricot brandy from New York to Texas.	Information filed; pending.
2247	F. B. Washburn & Co.	Massachusetts	Shipment of adulterated and misbranded macaroni from Massachusetts to Pennsylvania.	Do.
2248	J. T. Polk Co.	Indiana	Shipment of adulterated tomatoes from Indiana to Kentucky.	Defendant pleaded guilty; fined \$200 (case consolidated with F. & D. 1988).
2249	Iler & Co.	Nebraska	Shipment of adulterated Jamaica ginger from Nebraska to New Mexico.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 920.)
2250	H. Kohnstamm & Co.	New York, southern district.	Shipment of adulterated food product from New York to Alabama.	Information filed; pending.

2251	R. Hilliers Son Co.....	..... do.	Shipment of adulterated and misbranded drug product from New Jersey to California.	Nolle prossed.
2259	F. F. Stetson & Co....	California, southern district.	Shipment of adulterated blackberry jam from California to Arizona.	Information filed; pending.
2260	Peter Smith & Sons...	Michigan, eastern district.	Shipment of adulterated and misbranded olive oil from Michigan to Indiana.	Defendant pleaded nolo contendere; fined \$5 and costs. (Notice of Judgment No. 953.)
2261	Clifton Forge Ice & Bottling Works.	Virginia, western district.	Shipment of adulterated ice cream from Virginia to West Virginia.	Information filed; pending.
2262	Burlington Vinegar & Pickling Works.	Iowa, southern district.	Shipment of adulterated and misbranded catsup from Iowa to Nebraska.	Defendant pleaded guilty; fined \$50 and costs. (Notice of Judgment No. 1003.)
2263	A. Finke's Widow....	California, northern district.	Shipment of adulterated and misbranded champagne from California to Washington.	Indictment filed; pending.
2270	Harbauer-Marlean Co.	Ohio, northern district.	Shipment of misbranded catsup from Ohio to West Virginia.	Caso nolle prossed.
2271	F. A. & J. A. Greene..	Massachusetts.....	Shipment of misbranded drug product from Massachusetts to Pennsylvania.	Information filed; pending.
2274	Vincenzo Arezzo & Co.	New York, southern district.	Shipment of misbranded olives from New York to Pennsylvania.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 971.)
2275	Continental Cereal Co.	Illinois, southern district.	Shipment of misbranded stock feed from Illinois to Indiana.	Information filed; pending.
2276	French Bros. Bauer Co.	Ohio, southern district.	Shipment of adulterated milk and cream from Ohio to Kentucky.	Do.
2305	A. J. Lemke Medicine Co.	Wisconsin, eastern district.	Shipment of misbranded soothing drops from Wisconsin to Pennsylvania.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 933.)
2306	F. L. Kidder & Co....	Illinois, eastern district.	Shipment of misbranded feed product from Illinois to Indiana.	Defendant pleaded guilty; fined \$25.
2308	George B. Moock & Charles Braun.	Kentucky, eastern district.	Shipment of adulterated milk and cream from Kentucky to Ohio.	Defendant pleaded guilty; fined \$60 and costs.
2310	Harbauer-Marlean Co.	Ohio, northern district.	Shipment of adulterated and misbranded tomato catsup from Ohio to Missouri.	Nolle prossed.
2311	Crown Manufacturing Co.	New York, southern district.	Shipment of misbranded confectionery from New York to Pennsylvania.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 972.)
2314	S. P. Pond Co.....	Iowa, southern district.	Shipment of misbranded butter from Iowa to Pennsylvania.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 1018.)
2316	Wm. H. Anderson....	Wisconsin, eastern district.	Shipment of misbranded lithia water from Wisconsin to Indiana.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1032.)
2318	Ke-No Medicine Co....	Indiana.....	Shipment of misbranded drug product from Indiana to Kentucky.	Indictment filed; pending.
2319	J. C. Fowler Co.....	Virginia, eastern district.	Shipment of adulterated and misbranded extract of nutmeg from Virginia to Mississippi.	Information filed; pending.
2322	E. H. Hayden.....	District of Columbia..	Sale in the District of Columbia of adulterated oysters.	Do.
2323	James C. Bailey.....	do.....	do.....	Do.
2326	Fred C. Elder.....	Illinois, northern district.	Shipment of adulterated catsup compound from Illinois to Missouri.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 1034.)
2327	A. Finke's Widow....	California, northern district.	Shipment of adulterated and misbranded champagne from California to Arizona.	Indictment filed; pending.
2328	Schorndorfer & Eberhard Co.	Ohio, northern district.	Shipment of adulterated and misbranded lemon mixture from Ohio to New York.	Information filed; pending.
2329	Johnson Educator Food Co.	Massachusetts.....	Shipment of misbranded diabetic crackers from Massachusetts to Washington.	Do.
2330	Maul Bros.....	Missouri, eastern district.	Shipment of misbranded macaroni from Missouri to Arizona.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1278.)

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
2332	George Mortimer & Co.	Massachusetts.....	Shipment of misbranded drug product from Massachusetts to Pennsylvania.	Defendant pleaded guilty; fined \$150. (Notice of Judgment No. 1277.)
2333	S. Hirsch Distilling Co.	Missouri, western district.	Shipment of adulterated and misbranded peppermint extract from Missouri to Illinois.	Indictment filed; pending.
2334	McBride Bros. & Knobbe.	Illinois, northern district.	Shipment of adulterated ice cream from Illinois to Wisconsin.	Indictment returned; motion to quash overruled; demurrer pending.
2335	Woodhull Ice Cream Co.	.....do.....	Shipment of adulterated ice cream from Illinois to Indiana.	Do.
2336	Thompson-Reid Ice Cream Co.	.....do.....	Shipment of adulterated ice cream from Illinois to Wisconsin.	Do.
2337	Carhart & Bro.....	New York, southern district.	Shipment of misbranded coffee from New York to Alabama.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 981.)
2344	Magnus, Mabce & Reynard.	.....do.....	Shipment of adulterated and misbranded lemon oil from New York to North Carolina.	Information filed; pending.
2347	Clifton Forge Ice & Bottling Works.	Virginia, western district.	Shipment of adulterated ice cream from Virginia to West Virginia.	Do.
2348	Schmidler & Eberhard Co.	Ohio, northern district.	Shipment of misbranded "Lenore Mixture" from Ohio to Michigan.	Do.
2349	Clinton B. Ayars Canning Co.	New Jersey.....	Shipment of adulterated tomatoes from New Jersey to Pennsylvania.	Defendant pleaded non vult; sentence suspended. (Notice of Judgment No. 1237.)
2350	B. S. Ayars & Sons Co.	.....do.....	Shipment of adulterated tomato pulp from New Jersey to New York.	Do.
2351	Price Compound Co....	Minnesota.....	Shipment of adulterated and misbranded food product from Minnesota to Pennsylvania.	Information filed; pending.
2352	A. Finke's Widow....	California, northern district.	Shipment of adulterated and misbranded champagne from California to Washington.	Indictment filed; pending.
2353	J. B. Gruman Co.....	New York, southern district.	Shipment of adulterated and misbranded powdered turmeric from New York to Illinois.	Information filed; pending.
2354	Omaha Cold Storage Co.	Nebraska.....	Shipment of adulterated frozen eggs from Nebraska to Missouri.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 1296.)
2356	E. W. Oest Co.....	.....do.....	Shipment of adulterated jelly from California to Arizona.	Indictment filed; pending.
2357	Queen City Cider Vinegar Manufacturing Co.	California, northern district.	Shipment of adulterated and misbranded vinegar from Ohio to Indiana.	Defendant pleaded guilty; fined \$50 and costs. (Notice of Judgment No. 1116.)
2358	Bettman-Johnson Co....	Ohio, southern district.	Shipment of misbranded wine from Ohio to Iowa.	Information filed; pending.
2363	Harvey Nicholson.....	Missouri, eastern district.	Shipment of adulterated and misbranded olive oil from Missouri to Oklahoma.	Do.
2365	Bettman-Johnson Co....	Ohio, southern district.	Shipment of misbranded maraschino cherries from Ohio to Missouri.	Do.
2366	Huber & Fuhrman Drug Mills.	Wisconsin, eastern district.	Shipment of misbranded powdered Alexandria senna from Wisconsin to California.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1009.)

2369	Meyer & Lange.....	New York, southern district.	Shipment of adulterated anchovy paste from New York to Massachusetts.	Information filed; pending.
2370	St. Louis Syrup & Preserving Co.....	Missouri, eastern district.	Shipment of misbranded apple butter from Missouri to West Virginia.	Do.
2372	Algona Produce Co.....	Wisconsin, eastern district.	Shipment of misbranded cheese from Wisconsin to Missouri.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1002.)
2375	W. H. Breineman.....	Pennsylvania, middle district.	Shipment of adulterated mince meat from Pennsylvania to New York.	Defendant pleaded nolo contendere; fined \$15. (Notice of Judgment No. 1067.)
2378	Charles E. Smith.....	Indiana.....	Shipment of adulterated milk from Indiana to Ohio.....	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1083.)
2379	Dan McAvoy.....	do.....	do.....	Do.
2380	Fred Klein, sr.....	do.....	do.....	Indictment filed; pending.
2381	do.....	do.....	do.....	Do.
2382	L. H. Schulte.....	do.....	do.....	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 1083.)
2383	E. J. Koehlert.....	do.....	do.....	Do.
2384	Kate Conway.....	do.....	do.....	Nolle prossed.
2385	James F. Conlee.....	do.....	do.....	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1083.)
2386	Schuck Bros.....	do.....	do.....	Do.
2387	Herman Lohring.....	do.....	do.....	Indictment filed; pending.
2388	John Lotshaw.....	do.....	do.....	Do.
2389	Charles Oser.....	do.....	do.....	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1083.)
2390	Hudson & Cox.....	do.....	do.....	Do.
2391	H. A. Bobrink.....	do.....	do.....	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 1083.)
2392	J. T. Pump.....	do.....	do.....	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1083.)
2393	Chris. Bohle.....	do.....	do.....	Do.
2394	Samuel Wille's Sons.....	New York, southern district.	Shipment of misbranded coffee from New York to Indiana.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1125.)
2396	Pietro Roncoroni Co.....	New Jersey.....	Shipment of adulterated tomato paste from New Jersey to California.	Defendant pleaded non vult; sentence suspended. (Notice of Judgment No. 1053.)
2397	do.....	do.....	Shipment of adulterated tomato paste from New Jersey to New York.	Defendant pleaded non vult; sentence suspended. (Notice of Judgment No. 1065.)
2399	Edenton Peanut Co.....	North Carolina, eastern district.	Shipment of adulterated peanuts from North Carolina to Pennsylvania.	Information filed; pending.
2400	California Fruit Canners' Association.....	California, northern district.	Shipment of adulterated jams and jellies from California to Arizona.	Indictment filed; pending.
2406	Provident Chemical Works.....	Missouri, eastern district.	Shipment of adulterated food, "Clariphos," Missouri to Louisiana.	Information filed; pending.
2410	A. C. Soper Co.....	New Jersey.....	Adulterated tomato ketchup, New Jersey to New York.....	Information filed; pending.
2414	Jos. Middleby, jr.....	Massachusetts.....	Shipment of adulterated and misbranded currant jelly, Massachusetts to Louisiana.	Defendant pleaded non vult; sentence suspended. (Notice of Judgment No. 1055.)
2416	W. J. Bush & Co.....	New York, southern district.	Shipment of adulterated and misbranded drug product, New York to Michigan.	Information filed; pending.
2417	Rutger Bloecker & Co.....	do.....	Shipment of misbranded ank-ola coffee, New York to Illinois.	Do.
2418	Arturo Marchesini.....	Illinois, northern district.	Shipment of adulterated and misbranded salad oil, Illinois to Minnesota.	Do.
2419	S. Gumpert & Co.....	New York, southern district.	Shipment of adulterated and misbranded food product, New York to Texas.	Do.

Cases under the food and drugs act of June 30, 1906, reported for criminal prosecution during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
2421	J. B. Alexander.....	Kentucky, eastern dis- trict.	Shipment of adulterated milk, Kentucky to Ohio.....	Information filed; pending.
2422	Henry Menke.....	do.	do.	Do.
2423	George Lucas.....	do.	do.	Do.
2424	S. M. Hudson.....	do.	do.	Do.
2425	H. Noshbreide.....	do.	do.	Do.
2426	John Melman.....	do.	do.	Do.
2427	G. E. Carroll.....	do.	do.	Do.
2428	J. F. West.....	do.	do.	Do.
2429	Fountain of Youth Water Co.	Missouri, western dis- trict.	Shipment of misbranded mineral water, Missouri to Kansas.	Grand jury failed to indict.
2430	Amazon Vinegar & Pickling Works.	Iowa.....	Shipment of adulterated and misbranded vinegar, Iowa to Illinois.	Information filed; pending.
2443	C. I. Hood Co.....	Massachusetts.....	Shipment of misbranded drug product, Massachusetts to District of Columbia.	Do.
2444	Merchants' Drug Cor- poration.	New Jersey.....	Shipment of misbranded drug product, New Jersey to Massachusetts.	Defendant pleaded non vult; fined \$100. (Notice of Judg- ment No. 1003.)
2447	Baker Extract Co.....	Massachusetts.....	Shipment of misbranded lemon flavoring, Massachusetts to Ohio.	Nolle prossed.
2449	National Fruit Prod- ucts Co.	Tennessee, western dis- trict.	Shipment of adulterated and misbranded ciders, Tennessee to Texas.	Information filed; pending.
2451	Schorndorfer & Eber- hard Co.	Ohio, northern dis- trict.	Shipment of misbranded preserves, Ohio to New York.....	Do.
2452	Wheeler & Perry.....	Arizona.....	Sale of adulterated apples in Arizona.....	Grand jury failed to indict; pending.
2453	Mihalovich Co.....	Ohio, southern dis- trict.	Shipment of adulterated and misbranded peppermint ex- tract, Ohio to Pennsylvania.	Information filed; pending.
2454	C. I. Cotton Perfume & Extract Co.	New York, northern dis- trict.	Shipment of misbranded drug product, New York to Penn- sylvania.	Do.
2455	Pure Food Distilling Co.	Missouri, eastern dis- trict.	Shipment of adulterated and misbranded blackberry brandy, Missouri to Illinois.	Do.
2460	M. R. Stern.....	New York, southern district.	Shipment of adulterated and misbranded wine, New York to Massachusetts.	Do.
2463	Dr. Peebles Institute of Health.	Michigan, eastern dis- trict.	Shipment of misbranded drug product, Michigan to Dis- trict of Columbia.	Pleaded guilty; fined \$5. (Notice of Judgment No. 1079.)
2466	Ben Evers.....	Kentucky, eastern dis- trict.	Shipment of adulterated milk, Kentucky to Ohio.....	Information filed; pending.
2473	Tate Spring Co.....	Tennessee, eastern dis- trict.	Shipment of misbranded water, Tennessee to Georgia.....	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1140.)
2477	Schorndorfer & Eber- hard Co.	Ohio, northern dis- trict.	Shipment of misbranded preserves, Ohio to Pennsylvania.	Information filed; pending.
2483	Bettman-Johnson Co..	Ohio, southern dis- trict.	Shipment of misbranded maraschino cherries, Ohio to Louisiana.	Do.

2465	Oakland Vinegar & Pickle Co.	Michigan, eastern district.	Shipment of adulterated and misbranded apple-cider vinegar, Michigan to Minnesota.	Pleaded <i>nolo contendere</i> ; fined \$2. (Notice of Judgment No. 1060.)
2467	Union Manufacturing & Packing Co.	Utah.....	Shipment of misbranded essence of Jamaica ginger, Utah to Wyoming.	Information filed; pending.
2489	McMeehan Preserving Co.	West Virginia, northern district.	Shipment of misbranded jam, West Virginia to Indiana....	Do.
2492	Schorndorfer & Eberhard Co.	Ohio, northern district.	Shipment of misbranded preserves, Ohio to Pennsylvania.	Do.
2503	Bennett Howard Co....	Illinois, northern district.	Shipment of adulterated frozen canned egg, Illinois to Massachusetts.	Pleaded guilty; fined \$100. (Notice of Judgment No. 1116.)
2504	Northwest Mills Co....	Minnesota.....	Shipment of misbranded stock feed, Minnesota to Indiana.	Information filed; pending.
2509	Western Grain Products Co.	Indiana.....	Shipment of adulterated and misbranded stock feed, Indiana to Pennsylvania.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 1094.)
2511	Cerrodani & Co.....	Illinois, southern district.	Shipment of misbranded rheumatism capsules, Illinois to Michigan.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1025.)
2516	McMeehan Preserving Co.	West Virginia, northern district.	Shipment of misbranded preserves, West Virginia to Indiana.	Information filed; pending.
2520	Blair Milling Co.....	Kansas.....	Shipment of misbranded buckwheat flour, Kansas to Oklahoma.	Do.
2521	Model Mill Co.....	Tennessee, eastern district.	Shipment of misbranded middlings, Tennessee to South Carolina.	Pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1142.)
2524	Albert A. Deiser & Co.	Iowa, southern district.	Shipment of misbranded honey, Iowa to Nebraska.....	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1123.)
2531	Acme Extract & Chemical Works.	Pennsylvania, middle district.	Shipment of adulterated vanilla extract, Pennsylvania to District of Columbia.	Information filed; pending.
2536	McMeehan Preserving Co.	West Virginia, southern district.	Shipment of adulterated catsup, West Virginia to District of Columbia.	Do.
2541	W. J. Wilson & Son....	Washington, eastern district.	Shipment of adulterated and misbranded cider vinegar, Washington to Idaho.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1120.)
2542	Edw. Westen Tea & Spice Co.	Missouri, eastern district.	Shipment of misbranded rice, Missouri to Colorado.....	Information filed; pending.
2545	Stillman, Wright & Co.	Wisconsin, eastern district.	Shipment of misbranded buckwheat flour, Wisconsin to Missouri.	Defendant pleaded guilty; fined \$25.
2546	J. Graffini & Co.....	New York, southern district.	Shipment of adulterated and misbranded vermuth, New York to Pennsylvania.	Information filed; pending.
2548	Whitlie Springs Co....	Tennessee, eastern district.	Shipment of misbranded lithia water, Tennessee to Georgia.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1139.)
2549	Dr. W. Towns' Medical Co.	Wisconsin, eastern district.	Shipment of misbranded drug product, Wisconsin to District of Columbia.	Pleaded guilty; fined \$25. (Notice of Judgment No. 1170.)
2551	H. M. Gidden.....	New York, southern district.	Shipment of misbranded drug product, Wisconsin to District of Columbia.	Information filed; pending.
2553	McMeehan Preserving Co.	West Virginia, southern district.	Shipment of adulterated tomato catsup, West Virginia to Tennessee.	Do.
2554	Southern Fibre Co....	Virginia, eastern district.	Shipment of misbranded stock feed, Virginia to North Carolina.	Do.
2556	V. Del Galzo.....	New York, southern district.	Shipment of adulterated tomato paste, New York to Pennsylvania.	Do.
2557	.....do.....	.....do.....	Shipment of adulterated tomato sauce, New York to Pennsylvania.	Do.
2560	McMeehan Preserving Co.	West Virginia, northern district.	Shipment of adulterated catsup, West Virginia to District of Columbia.	Do.
2568	Pressing & Orr Co.....	Ohio, northern district.	Shipment of adulterated catsup, Ohio to West Virginia....	Do.

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F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
2569	New Vienna Medicine Co.	Indiana.....	Shipment of misbranded drug preparation, Indiana to Ohio.	Plead guilty; fined \$200. (Notice of Judgment No. 1093.)
2573	Northeast Preserving Works	Pennsylvania, western district.	Shipment of adulterated tomato pulp, Pennsylvania to Ohio.	Information filed; pending.
2575	Kellogg Manufacturing Co.	Iowa.....	Shipment of misbranded "sugar butter," Iowa to Indiana.	Do.
2577	Delavan Condensed Milk Co.	Wisconsin, eastern district.	Shipment of misbranded condensed milk, Wisconsin to Missouri.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1028.)
2581	Phoenix Packing Co.	California, southern district.	Shipment of misbranded raisins, California to Arizona.	Information filed; pending.
2582	Oelrich & Berry Co.	Illinois, northern district.	Shipment of misbranded jelly, Illinois to Nebraska.	Do.
2583	Blue Seal Supply Co.	Massachusetts.....	Shipment of adulterated and misbranded "wild cherry flavor," Massachusetts to Minnesota.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1040.)
2584	Dodson's Remedy Co.	Virginia, eastern district.	Shipment of misbranded headache remedy, Virginia to Massachusetts.	Information filed; pending.
2585	Provident Chemical Works.	Missouri, eastern district.	Shipment of adulterated chlorophos, Missouri to Louisiana.	Do.
2589	Fitch Remedy Co.	Wisconsin, eastern district.	Shipment of misbranded rheumatic cure, Wisconsin to Minnesota.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1024.)
2594	W. P. Barnaguzzi	New York, southern district.	Shipment of misbranded olive oil, New York to Missouri.	Information filed; pending.
2597	American Clieck Co.	Oregon.....	Shipment of misbranded chewing gum, Oregon to Washington.	Do.
2598	Kuner Pickle Co.	Utah.....	Shipment of adulterated catsup, Utah to Idaho.	Do.
2605	I. S. Johnson & Co.	Massachusetts.....	Shipment of misbranded drug product, Massachusetts to Oregon.	Do.
2615	Stewart & Holmes Drug Co.	Washington, western district.	Shipment of misbranded and adulterated fruit sirups, Washington to Oregon.	Plead nolo contendere; fined \$25. (Notice of Judgment No. 1156.)
2616	R. C. Chance's Sons	New Jersey.....	Shipment of adulterated catsup, New Jersey to District of Columbia.	Plead nolo contendere; fined \$25 and costs.
2620	C. F. Blanke Tea & Coffee Co.	Missouri, eastern district.	Shipment of misbranded coffee, Missouri to Louisiana.	Information filed; pending.
2630	Brewster-Corcoran Manufacturing Co.	New Jersey.....	Shipment of adulterated and misbranded chocolate, New Jersey to Ohio.	Do.
2632	Fleischmann Co.	New York, southern district.	Shipment of misbranded apricot brandy, New York to Massachusetts.	Do.
2636	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of misbranded open-kettle molasses tentors, Missouri to Wisconsin.	Do.
2637	E. R. Durkee & Co.	New York, southern district.	Shipment of misbranded salad dressing, New York to Alabama.	Do.
2638	do.	do.	do.	Do.
2647	Martin Bros. & Co.	Colorado.....	Shipment of misbranded butter, Colorado to New Mexico.	Do.

2655	Meyer Bros. Drug Co.	Missouri, eastern district.	Shipment of adulterated and misbranded peroxide of hydrogen, Missouri to Nebraska.	Do.
2660	Aschenbach & Miller.	Pennsylvania, eastern district.	Shipment of misbranded drug product, Pennsylvania to Massachusetts.	Defendant pleaded guilty; fined \$25.
2685	Edgar Morgan Co.	Tennessee, western district.	Shipment of adulterated and misbranded cattle feed, Tennessee to Florida.	Information filed; pending.
2691	Henry Heide.	New York, southern district.	Shipment of adulterated almond paste, New York to California.	Do.
2693	Ignatius Gross Co.	do.	Shipment of adulterated tomato sauce, New York to Pennsylvania.	Do.
2698	M. R. Stern & Co.	do.	Shipment of adulterated and misbranded extract of peppermint, New York to Texas.	Do.
2702	S. D. Conwell & Co.	Pennsylvania, eastern district.	Shipment of adulterated and misbranded vanilla flavor, Pennsylvania to New Jersey.	Do.
2703	The Howard W. Spurr Coffee Co.	Massachusetts.	Shipment of adulterated Mocha and Java coffee, Massachusetts to Pennsylvania.	Do.
2709	Lewis German & Co.	New York, southern district.	Shipment of adulterated grinding nutmegs, New York to Massachusetts.	Defendant pleaded guilty; fined \$20. (Notice of Judgment No. 1180.)
2711	R. C. Chance's Sons.	New Jersey.	Shipment of adulterated tomato catsup, Pennsylvania to Massachusetts.	Information filed; pending.
2715	M. R. Stern.	New York, southern district.	Shipment of adulterated and misbranded sirup of tamarind, New York to Missouri.	Do.
2718	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of misbranded table sirup, Missouri to Wisconsin.	Do.
2719	Danna Canned Goods Co.	Ohio, southern district.	Shipment of adulterated tomato paste, Ohio to Kentucky.	Do.
2720	New York Central & Hudson River R. R. Co.	New York, northern district.	Shipment of adulterated milk and cream, New York to Massachusetts.	Do.
2731	E. S. Wells.	New Jersey.	Shipment of misbranded hair balsam, New Jersey to Ohio.	Do.
2738	Star Water Co.	Alabama, northern district.	Shipment of adulterated ice-cream cones, Alabama to Tennessee.	Do.
2742	Philadelphia Pickling Co.	New Jersey.	Shipment of adulterated tomato paste, New Jersey to Pennsylvania.	Do.
2747	Isaac Rosanbaum & Sons.	Kentucky, western district.	Shipment of adulterated and misbranded drug, Kentucky to Minnesota.	Defendant pleaded guilty; fined \$10 and costs.
2748	James T. Ayers.	Virginia, western district.	Shipment of adulterated dried peaches.	Information filed; pending.
2767	National Pickle & Canning Co.	Missouri, western district.	Shipment of misbranded tomato catsup, Missouri to Kansas.	Do.

SUMMARY.

Cases terminated in favor of the Government.	227
Cases terminated in favor of the defendants.	4
No service obtained on defendant.	1
No indictments returned by grand jury.	7
Cases nolle prossed.	16
Cases pending in the courts.	221
Cases pending in the Department of Justice.	349
Total criminal cases reported for prosecution.	825

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
1637	48 packages ice-cream cones.....	Georgia, northern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed.
1638	200 sacks oats.....	Mississippi, southern district.....	Adulterated and misbranded.....	Libel filed; seizure effected; goods released on bond. (Notice of Judgment No. 1146.)
1639	25,008 pounds frozen eggs.....	New York, eastern district.....	Adulterated.....	Libel filed; seizure effected; pending.
1640	20, 70, and 10 packages of antikamnia..	District of Columbia.....	Misbranded.....	Libel filed; seizure effected; claimants exceptions to libel sustained; judgment affirmed by court of appeals; Government's appeal to Supreme Court pending.
1646	50 and 100 cases of noodles.....	Pennsylvania, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 652.)
1647	18 crates ice-cream cones.....	New York, southern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed (Notice of Judgment No. 911.)
1648	23 crates ice-cream cones.....	.....do.....	.....do.....	Do.
1655	1 barrel dry egg albumen.....	Missouri, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1300.)
1656	48 cases sardines.....	Mississippi, northern district.....	.....do.....	Libel filed; seizure effected; goods released on payment of costs.
1657	20 crates ice-cream cones.....	Missouri, western district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1315.)
1677	5 barrels catsup.....	Pennsylvania, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 670.)
1678	4 boxes and 25 boxes macaroni.....	New Jersey.....	Misbranded.....	Decree of condemnation and forfeiture.
1679	241 and 215 cans frozen eggs.....	New York, southern district.....	Adulterated.....	Libel filed; seizure effected; pending.
1680	200 cases sardines.....	Texas, southern district.....	.....do.....	Libel filed; seizure effected; goods released on payment of costs.
1691	30 boxes ice-cream cones.....	Tennessee, middle district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 831.)
1694	Frozen egg products.....	Pennsylvania, western district.....	.....do.....	Libel filed; seizure effected; dismissed.
1698	151 and 43 cans frozen eggs.....	New York, southern district.....	.....do.....	Libel filed; seizure effected; pending.
1699	50, 50 and 10 boxes ice-cream cones.....	Missouri, western district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 814.)
1700	192 boxes ice-cream cones.....	Louisiana, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1073.)
1701	208 boxes ice-cream cones.....	.....do.....	.....do.....	Do.
1702	2 barrels catsup.....	Pennsylvania, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 670.)
1706	.....do.....	.....do.....	.....do.....	Do.
1708	50 cases macaroni.....	Ohio, southern district.....	Misbranded.....	Decree of condemnation and forfei ure; goods destroyed. (Notice of Judgment No. 849.)
1712	19 boxes prunes.....	District of Columbia.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No 833.)
1730	68 cases tomatoes.....	Pennsylvania, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 671.)
1735	150,000, more or less, ice-cream cones.....	Nebraska.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 668.)

1739	5 boxes ice-cream cones; 5 boxes wafers.	Pennsylvania, eastern district.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 672.)
1740	72 boxes ice-cream cones.	do.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 669.)
1741	20 boxes cheese.	Maryland.	Misbranded.	Decree of condemnation; goods released on bond. (Notice of Judgment No. 651.)
1751	6 drums desiccated eggs.	New York, southern district.	Adulterated.	Label filed; seizure effected; pending.
1752	13 cases sirup.	Minnesota.	Misbranded.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 857.)
1753	100 barrels vinegar.	Indiana.	Adulterated and misbranded.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 844.)
1754	3,000 pounds frozen eggs.	Connecticut.	Adulterated.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 873.)
1756	83 boxes figs.	Massachusetts.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 813.)
1759	50 cases Holland rusks.	Pennsylvania, eastern district.	do.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 696.)
1760	58 cases ice-cream cones.	Arkansas, eastern district.	do.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 651.)
1768	50 cases sarlines.	Missouri, eastern district.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 676.)
1769	do.	do.	do.	Label filed; seizure effected; pending.
1770	250 cases sardines.	do.	do.	Libel dismissed; product returned to claimant.
1771	50 cases sardines.	do.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 696.)
1772	do.	do.	do.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 651.)
1776	25 cases Holland rusks.	Pennsylvania, eastern district.	do.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 696.)
1781	39 boxes cheese.	Maryland.	Misbranded.	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 651.)
1784	3 barrels desiccated eggs.	New York, southern district.	Adulterated.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 676.)
1785	150 cans frozen eggs.	New York.	do.	Label filed; seizure effected; pending.
1788	2 barrels vanilla extract.	District of Columbia.	Adulterated and misbranded.	Libel dismissed; product returned to claimant.
1789	20 cases pineapples.	Pennsylvania, eastern district.	Adulterated.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 696.)
1794	355 boxes evaporated apples.	Texas, western district.	Adulterated and misbranded.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 949.)
1795	337 boxes raisins.	Pennsylvania, eastern district.	Adulterated.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1274.)
1796	9 tubs butter.	Connecticut.	Adulterated and misbranded.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 721.)
1797	2 boxes tea.	Tennessee, middle district.	Adulterated.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 829.)
1798	110 boxes ice-cream cones.	Tennessee, western district.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 725.)
1799	30 crates (720 boxes) ice-cream cones.	Alabama, northern district.	do.	Label filed; seizure effected; pending.
1800	13 cases ice-cream cones.	Tennessee, eastern district.	do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 724.)
1801	51 barrels vinegar.	Indiana.	Adulterated and misbranded.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 967.)
1803	80 barrels vinegar.	New Hampshire.	Misbranded.	Label filed; seizure effected; pending.
1804	101 cases eggs.	Missouri, eastern district.	Adulterated.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 969.)

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
1814	33 barrels vinegar.....	Iowa, southern district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods.
1816	50 cases canned clams.....	Massachusetts.....	Misbranded.....	Do.
1819	25 barrels vinegar.....	Maryland.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1023.)
1820	.....do.....	Missouri.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods relabeled. (Notice of Judgment 815.)
1821	.....do.....	Missouri, western district.....	.....do.....	Do.
1822	225 cases ketchup.....	Iowa, southern district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods.
1823	3 cases (150 packages) crackers.....	Pennsylvania, eastern district.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods.
1831	325 cases water.....	Tennessee, western district.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 808.)
1832	166 cases ice-cream cones.....	Texas, northern district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 830.)
1833	63 barrels vinegar.....	Indiana.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed.
1840	1 barrel turpentine.....	Connecticut.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 883.)
1842	24 boxes macaroni.....	District of Columbia.....	Misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 712.)
1847	10 barrels codfish.....	Pennsylvania, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 776.)
1848	200 drums haddock.....	.....do.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 778.)
1849	60 barrels vinegar.....	Massachusetts.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 779.)
1853	70 cheeses.....	Alabama, middle district.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1285.)
1854	50 barrels catsup.....	Kentucky, western district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 705.)
1860	62 barrels tomato catsup.....	Washington, western district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 992.)
1861	95 cheeses.....	Alabama, middle district.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 827.)
1863	19 barrels black olives.....	Pennsylvania, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 704.)
1867	4 crates and 3 containers of 5 gallons each, of eggs.....	District of Columbia.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 817.)
1868	14 cans frozen eggs.....	.....do.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 782.)
1869	4 tubs frozen eggs.....	.....do.....	.....do.....	Do.
1870	14 tubs frozen eggs.....	.....do.....	.....do.....	Do.

1879	7 bags and 1,164 mats green coffee.....	New York, southern district.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 98.)
1880	144 cans frozen eggs.....	Pennsylvania, western district.....	.....do.....	Libel filed; seizure effected; pending.
1881	50 barrels fish.....	Pennsylvania, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 779.)
1885	200 bushels oysters.....	District of Columbia.....	Adulterated.....	Goods not found.
1886	.....do.....	.....do.....	.....do.....	Do.
1887	250 bushels oysters.....	.....do.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 944.)
1889	53 bags shelled peanuts.....	Maryland.....	.....do.....	Decree of condemnation and forfeiture.
1890	16 and 48 boxes macaroni.....	Pennsylvania, western district.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1145.)
1895	65 cases bitters.....	New York, southern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 726.)
1896	5 cases coffee and chicory compound.....	Alabama, middle district.....	.....do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 714.)
1901	1 barrel gelatin.....	Pennsylvania, eastern district.....	Adulterated.....	Seizure effected; dismissed.
1903	10 bags shelled peanuts.....	Maryland.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 944.)
1908	75 barrels vinegar.....	Illinois, northern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods ordered for sale. (Notice of Judgment No. 910.)
1914	400 bags corn meal.....	North Carolina, northern district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 884.)
1936	798 cases tomato catsup.....	Minnesota.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1110.)
1943	50 boxes evaporated apples.....	Texas, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 976.)
1944	5 barrels catsup.....	Maryland.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 936.)
1947	35 barrels and 25 half barrels vinegar.....	Texas, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 977.)
1959	2 barrels turpentine.....	Connecticut.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 792.)
1960	4 barrels turpentine.....	.....do.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 929.)
1963	2 half barrels and 9 pails mince meat.....	New York, northern district.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 766.)
1967	50 boxes butter.....	Pennsylvania, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 713.)
1968	20 boxes macaroni.....	New Jersey.....	.....do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 881.)
1974	10 barrels tomato pulp.....	Pennsylvania, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 717.)
1979	2 barrels wine.....	.....do.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 737.)
1980	25 cases cherries.....	.....do.....	Adulterated.....	Seizure effected; dismissed.
1981	2 drums Sporty Days Invigorator.....	Texas, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 791.)
1982	400 cases ketchup.....	Wisconsin, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 781.)
1983	34 pails mincemeat.....	New York, northern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 768.)

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
1984	1 barrel, 9 half barrels, and 11 pails mince meat.	New York, northern district.	Adulterated.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 765.)
1986	60 boxes macaroni.	West Virginia.	Misbranded.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 804.)
1987	4 barrels catsup.	Maryland.	Adulterated.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 955.)
1992	80 barrels catsup.	Louisiana, eastern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 838.)
1993	2 barrels catsup.	New York, southern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 700.)
1995	100 cases, 15 barrels catsup.	Missouri, eastern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1085.)
2000	3 gross lemon extracts.	Michigan, eastern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1314.)
2003	20 bags peanuts.	Maryland.	.....do.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 945.)
2007	1 barrel vinegar.	Tennessee, middle district.	Misbranded.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1225.)
2009	8 barrels and 3 half barrels vinegar.	Tennessee, eastern district.	Adulterated and mis- branded.	Decree of condemnation and forfeiture; goods sold. (Notice of Judgment No. 1308.)
2010	100 cases catsup.	Missouri, eastern district.	Adulterated.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1086.)
2016	2 barrels catsup.	New York, southern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 761.)
2017	3 barrels catsup.	.....do.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 763.)
2018	7 barrels catsup.	.....do.	.....do.	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1007.)
2022	9 barrels vinegar.	Arizona.	Adulterated and mis- branded.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 745.)
2025	7 cases drug product.	Pennsylvania, eastern district.	Misbranded.	Decree of condemnation and forfeiture; goods sold. (Notice of Judgment No. 1200.)
2029	1 barrel vinegar.	Indiana.	Adulterated.	Decree of condemnation and forfeiture. (Notice of Judgment No. 1084.)
2030	74 sacks coffee.	Louisiana, eastern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 744.)
2032	5 barrels tomato pulp.	Pennsylvania, eastern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 744.)
2041	200 cases tomato paste.	New York, eastern district.	.....do.	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 762.)
2042	100 cases tomato paste.	New York, southern district.	Adulterated and mis- branded.	Do.
2043	175 cases ketchup.	Vermont.	Adulterated.	Decree of condemnation and forfeiture.

2044	350 cases ketchup.....	Kentucky, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 743.)
2046	7 cases misbranded bitters.....	Pennsylvania, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 743.)
2047	20 barrels vinegar.....	Missouri, eastern district.....	Adulterated and misbranded.....	Libel filed; seizure effected; pending.
2051	10 bags peanuts.....	Maryland.....	Adulterated.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 957.)
2062	23 barrels tomato paste.....	New Jersey.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 893.)
2063	84 barrels tomato paste.....	.....do.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 894.)
2070	448 cases catsup.....	Missouri, eastern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed.
2078	25 cases apples.....	Kentucky, eastern district.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 934.)
2079	35 cases, 60 boxes, 450 bags, and 50 bags apples.....	.....do.....	.....do.....	Do.
2081	60 barrels tomato paste.....	New Jersey.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 894.)
2084	50 barrels catsup.....	Pennsylvania, western district.....	.....do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1196.)
2085	100 barrels catsup.....	.....do.....	.....do.....	Do.
2086	100 barrels vinegar.....	Missouri, eastern district.....	Adulterated and misbranded.....	Libel filed; seizure effected; pending.
2087	50 crates catsup.....	Oklahoma.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 943.)
2088	58 barrels tomato paste.....	New Jersey.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 894.)
2089	17 boxes apples.....	Arizona.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 978.)
2090	720 cans eggs.....	New York, eastern district.....	Adulterated.....	Seizure effected; dismissal.
2092	15 cases wine.....	Minnesota.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1149.)
2093	10 cases wine.....	.....do.....	Misbranded.....	Do.
2094	300 cans eggs.....	New York, southern district.....	Adulterated.....	Seizure effected; dismissed.
2101	40 half-barrels eggs.....	Illinois, northern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 879.)
2102	2 barrels black olives.....	Missouri, western district.....	.....do.....	Judgment for claimant; Government's appeal pending. (Notice of Judgment No. 1027.)
2103	443 cans frozen eggs.....	New Jersey.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 893.)
2104	100 cans tomato paste.....	West Virginia, northern district.....	.....do.....	Libel filed; seizure effected; goods released on bond. (Notice of Judgment No. 1299.)
2105	5 barrels sardines.....	Maine.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 925.)
2120	800 cases catsup.....	Illinois, southern district.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1034.)
2121	600 cans catsup.....	Nebraska.....	.....do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 789.)
2131	3 barrels oysters.....	District of Columbia.....	.....do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 800.)
2135	100 barrels tomato pulp.....	West Virginia, northern district.....	.....do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 890.)
2136	35 cans frozen eggs.....	New Jersey.....	.....do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 890.)

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
2139	100 cans frozen eggs.....	Massachusetts.....	Adulterated.....	Libel filed; seizure effected; pending.
2142	100 dozen bottles beer.....	Ohio, southern district.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 866.)
2143	40 cheeses.....	Florida, southern district.....	do.....	Libel filed; seizure effected; pending.
2149	25 crates frozen eggs.....	Illinois, northern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1046.)
2152	150 crates frozen eggs.....	Missouri, western district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 890.)
2153	100 barrels tomato pulp.....	West Virginia, northern district.....	do.....	Goods not found.
2154	100 barrels vinegar.....	Minnesota.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1001.)
2157	25 cases tomato paste.....	Pennsylvania, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 801.)
2159	20 cases tomato paste.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 886.)
2160	301 cases tomato catsup.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1224.)
2161	25 cases tomato catsup.....	Tennessee, middle district.....	do.....	Libel filed; seizure effected; dismissed.
2165	3 barrels powdered milk.....	New Jersey.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1202.)
2166	10 cases shell eggs.....	Indiana.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 947.)
2167	18 barrels catsup.....	Maryland.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1163.)
2168	300 cases tomato catsup.....	Missouri, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1175.)
2169	100, 200, and 257 cans tomato catsup.....	do.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1162.)
2170	171 and 73 cases tomato catsup.....	do.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 880.)
2171	60 cases tomato pulp.....	Minnesota.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1231.)
2172	60 cases tomato paste.....	California, northern district.....	do.....	Libel filed; seizure effected; claimants' exceptions sustained; pending.
2178	7 cases Buffalo lithia water.....	District of Columbia.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1201.)
2179	3 cases Buffalo lithia water.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1201.)
2180	700 cases tomato catsup.....	Indiana.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1231.)
2181	475 cases tomato catsup.....	do.....	do.....	Decree of condemnation and destruction. (Notice of Judgment No. 1231.)
2182	350 cases tomato paste.....	California, northern district.....	Adulterated and misbranded.....	

2183	8 boxes prunes.....	Maryland.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 948.)
2184	2 barrels desiccated eggs.....	Minnesota.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1005.)
2185	350 cases tomato catsup.....	New Jersey.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 821.)
2186	25 barrels tomato catsup.....	Louisiana, eastern district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1073.)
2189	3 barrels milk.....	New Jersey.....	do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1303.)
2193	25 cases tomato pulp.....	Florida, southern district.....	do.....	Libel filed; seizure effected; pending.
2195	100 cans eggs.....	District of Columbia.....	do.....	Seizure effected; dismissed.
2197	5 barrels catsup.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 805.)
2198	650 cans eggs.....	New Jersey.....	do.....	Seizure effected; dismissed.
2204	100 cases tomato catsup.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 821.)
2205	75 cases tomato catsup.....	do.....	do.....	Do.
2206	1,460 cases sardines.....	Pennsylvania, western district.....	do.....	Libel filed; seizure effected; pending.
2211	6 cases maple sirup.....	New York, southern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 802.)
2212	120 cases tomato paste.....	Illinois, northern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1008.)
2214	3 barrels eggs.....	New York, southern district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 850.)
2215	9 barrels tomato paste.....	Pennsylvania, eastern district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 973.)
2217	80 barrels vinegar.....	Missouri, western district.....	do.....	Decree of condemnation and forfeiture; goods sold. (Notice of Judgment No. 1151.)
2223	10 barrels tomato ketchup.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 887.)
2234	2 barrels desiccated eggs.....	New York, southern district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 850.)
2235	1 barrel desiccated eggs.....	do.....	do.....	Do.
2236	2 barrels desiccated eggs.....	do.....	do.....	Do.
2237	24 cans frozen eggs.....	New Jersey.....	do.....	Libel filed; goods not found.
2238	105 cans frozen eggs.....	do.....	do.....	Do.
2242	4 boxes evaporated peaches.....	Maryland.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 946.)
2252	61 barrels milk.....	do.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond filed for release. (Notice of Judgment No. 979.)
2253	10 cases eggs.....	Massachusetts.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 878.)
2258	15 dozen packages Make Man Tablets.....	District of Columbia.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 891.)
2265	7 barrels eggs.....	do.....	Adulterated.....	Libel filed; seizure effected; discontinued.
2272	5 barrels eggs.....	Missouri, eastern district.....	do.....	Libel filed; seizure effected; stipulation filed to set aside decree of condemnation and forfeiture; goods released.
2273	985 bundles bread or matzes.....	Maryland.....	do.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 954.)
2297	10 barrels black olives.....	Pennsylvania, eastern district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 869.)

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
2313	1 barrel vanilla extract.....	New Jersey.....	Adulterated and mis- branded.....	Libel filed; seizure effected; pending.
2315	5 barrels whisky.....	Florida.....	Misbranded.....	Do.
2338	100 barrels vinegar.....	Minnesota.....	Adulterated and mis- branded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1159.)
2339	15 and 5 cases coffee.....	Louisiana, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture; released on bond. (Notice of Judgment No. 1191.)
2340	30 and 5 cases coffee.....	do.....	do.....	Decree of condemnation and forfeiture; released on bond. (Notice of Judgment No. 1190.)
2341	60 cases coffee.....	Louisiana, western district.....	do.....	Libel filed; seizure effected; pending.
2342	10 cases coffee.....	do.....	do.....	Do.
2343	60 and 40 cases coffee.....	do.....	do.....	Do.
2345	700 tubs eggs.....	Missouri, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 970.)
2346	36 tubs eggs.....	do.....	do.....	Do.
2360	216 barrels tomato pulp.....	Kentucky, western district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 993.)
2361	270 barrels tomato pulp.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 994.)
2362	50 cases champagne.....	Pennsylvania, eastern district.....	Misbranded.....	Seizure effected; dismissed.
2376	100 cans eggs.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 961.)
2377	8 ears feed mixture.....	New Jersey.....	do.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 923.)
2401	75 cheeses.....	Georgia, northern district.....	Misbranded.....	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 914.)
2402	1 case dried mushrooms.....	Pennsylvania, western district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1037.)
2403	34 cans eggs.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 963.)
2404	5 barrels olives.....	Pennsylvania, western district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1047.)
2405	4 barrels black olives.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1048.)
2411	50 boxes cheese.....	Kentucky, western district.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 995.)
2412	450 cases tomato catsup.....	Kansas.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 922.)
2429	30 barrels catsup.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 975.)
2430	35 cases figprune cereal.....	Minnesota.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 975.)
2432	10 barrels vinegar.....	Wisconsin, eastern district.....	do.....	Decree of condemnation and forfeiture; goods sold.

2433	1 case of fish	District of Columbia	Adulterated	Seizure effected; dismissed.
2434	do	do	do	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1021.)
2435	do	do	do	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1088.)
2436	do	do	do	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1087.)
2446	8 cases coffee mixture	Louisiana, western district	Misbranded	Decree of condemnation and forfeiture; goods released on bond.
2450	1 barrel egg albumen	Minnesota	Adulterated	Seizure effected; dismissed.
2457	3 barrels eggs	Pennsylvania, western district	do	Do
2458	8 cases sardines	Pennsylvania, eastern district	do	Label filed; seizure effected; pending.
2459	10 cases "Clear"	Indiana	Misbranded	Shipment disposed of before seizure could be effected. (Notice of Judgment No. 924.)
2461	Lot of bottled water	District of Columbia	do	Decree of condemnation and forfeiture; bond filed.
2465	3 half-barrels catsup	Tennessee, western district	Adulterated	(Notice of Judgment No. 1072.)
2470	14 cases liqouzone	New York, southern district	Misbranded	Label filed; seizure effected; dismissed.
2471	50 cheeses	District of Columbia	do	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 980.)
2474	1,200 packages gelatin	Pennsylvania, eastern district	Adulterated	Seizure effected; dismissed.
2475	5 gross packages gelatin	do	do	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1128.)
2479	75 gross packages gelatin	do	do	Seizure effected; dismissed.
2480	400 sacks stock feed	Florida, southern district	Misbranded	Label filed; seizure effected; pending.
2481	500 sacks stock feed	do	do	Do
2485	5 cases water	District of Columbia	do	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 968.)
2490	6 cases gelatin	Pennsylvania, eastern district	Adulterated	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1127.)
2491	830 sacks flour	Pennsylvania, western district	Misbranded	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 940.)
2493	23 gross packages gelatin	Pennsylvania, eastern district	Adulterated	Seizure effected; dismissed.
2494	20 drums coffee	Nevada	Misbranded	Decree of condemnation and forfeiture; bond filed for release of goods.
2496	10 barrels phosphate fluid	Indiana	Adulterated	Label filed; Goods not found.
2497	100 barrels phosphate	do	do	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1203.)
2498	1 barrel vanilla	New Jersey	do	Decree of condemnation and forfeiture; goods destroyed.
2500	100 cases eggs	New York, southern district	do	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 974.)
2505	7 cases tomato paste	Pennsylvania, western district	do	Label filed; seizure effected; pending.
2506	59 boxes candy eggs	Massachusetts	do	Do
2498	1 barrel vanilla	New Jersey	Adulterated and misbranded	Do
2510	2 barrels whisky	Georgia, southern district	Misbranded	Do
2514	30 barrels vinegar	New Jersey	Adulterated and misbranded	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1184.)
2517	355 boxes oranges	Louisiana, eastern district	Misbranded	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 939.)
2519	1 keg vanilla	Missouri, eastern district	Adulterated and misbranded	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1104.)
2522	80 boxes candy eggs; 33 boxes peaches and pears.	Massachusetts	Adulterated	Label filed; seizure effected; pending.

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
2523	1 barrel vanilla.....	New York, southern district.....	Adulterated and mis- branded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 983.)
2525	1 barrel vinegar.....	New Jersey.....	.....	Decree of condemnation and forfeiture; goods destroyed.
2526	30 barrels jelly eggs.....	New Jersey.....	Adulterated.....	Libel filed; seizure effected; pending.
2527	10 barrels powdered milk.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1033.)
2528	3 barrels black olives.....	Maryland.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1275.)
2529	4 barrels dried milk.....	Virginia, eastern district.....	Adulterated and mis- branded.....	Libel filed; seizure effected; pending.
2532	1 barrel cocoa almonds.....	Rhode Island.....	Adulterated.....	Do.
2533	3 barrels gelatine.....	Pennsylvania, eastern district.....	do.....	Libel filed; seizure effected; dismissed.
2534	1 barrel jelly beans.....	Rhode Island.....	do.....	Decree of condemnation and forfeiture; goods destroyed. ¹ (Notice of Judgment No. 1150.)
2537	1 5-gallon package vanilla.....	New Jersey.....	Adulterated and mis- branded.....	Libel filed; seizure effected; pending.
2538	1 10-gallon package vanilla.....	do.....	do.....	Seizure effected; dismissed.
2539	6 barrels condensed milk.....	Maryland.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 989.)
2540	10 cans chocolate cremolin.....	Pennsylvania, eastern district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 984.)
2543	60 cases tomato pulp.....	District of Columbia.....	Adulterated.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1000.)
2547	125 barrels sodic alummic sulphate.....	Missouri, eastern district.....	do.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1042.)
2562	175 cases sugar corn flakes.....	do.....	Misbranded.....	Libel filed; seizure effected; pending.
2564	2 barrels jelly beans.....	Rhode Island.....	Adulterated.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1105.)
2565	131 barrels sodic alummic sulphate.....	Missouri, eastern district.....	do.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1061.)
2587	2 barrels imitation extract vanilla.....	Massachusetts.....	Adulterated and mis- branded.....	Libel filed; seizure effected; pending.
2591	5 packages Mother's gelatine.....	District of Columbia.....	do.....	Do.
2595	5 barrels shred gelatine.....	Indiana.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1022.)
2596	8 barrels acid phosphate calcium.....	Massachusetts.....	do.....	Label filed; seizure effected; pending.
2600	2 5-gallon containers turpentine.....	District of Columbia.....	do.....	Do.
2601	3 barrels vanilla and tonka flavor.....	Louisiana, eastern district.....	Adulterated and mis- branded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1022.)
2602	3 barrels vinegar.....	New York, western district.....	do.....	Label filed; seizure effected; pending.
2603	17 barrels vinegar.....	do.....	do.....	Do.
2604	4 cases olive oil.....	Colorado.....	Misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1305.)

2606	25 sacks rice.....	District of Columbia.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1030.)
2607	10 containers olive oil.....	do.....	do.....	Libel filed; seizure effected; pending.
2608	60 bags dried apple chips.....	Maryland.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1313.)
2610	57 barrels ginger ale.....	District of Columbia.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1026.)
2613	2 barrels olives.....	Indiana.....	Adulterated.....	Goods not found.
2617	12 sacks sugar.....	Wisconsin, eastern district.....	do.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1309.)
2618	8 barrels sodic aluminate sulphate.....	Indiana.....	do.....	Goods not found.
2619	219 cases evaporated milk.....	Illinois, northern district.....	Misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1050.)
2622	3 dozen packages "Denton's Healing Balsam,".....	Michigan, eastern district.....	do.....	Libel filed; seizure effected; pending.
2624	6 dozen packages "Denton's Healing Balsam,".....	do.....	do.....	Do.
2631	26 cherees.....	Tennessee, eastern district.....	do.....	Decree of condemnation and forfeiture; goods sold.
2633	90 barrels vinegar.....	Massachusetts.....	Adulterated and misbranded.....	Libel filed; seizure effected; pending.
2644	10 boxes cheese.....	Kentucky, eastern district.....	Misbranded.....	Do.
2645	3 barrels milk powder.....	New Jersey.....	Adulterated and misbranded.....	Libel filed; seizure effected; dismissed.
2649	3 barrels coconut.....	Georgia, southern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed.
2651	10 30-pound pails strawberry preserves.....	Louisiana, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1302.)
2654	5 barrels vinegar.....	Minnesota.....	do.....	Goods not found.
2657	3 barrels turpentine.....	Connecticut.....	do.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1124.)
2658	1 barrel vanilla.....	New York, northern district.....	do.....	Decree of condemnation and forfeiture; bond filed for release of goods.
2659	35 boxes cheese.....	Mississippi, southern district.....	do.....	Do.
2666	32 cans eggs.....	New Jersey.....	Adulterated.....	Libel filed; seizure effected; pending.
2667	10 kegs oiler.....	Kentucky, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed for release of goods. (Notice of Judgment No. 1069.)
2668	10 barrels condensed milk.....	Missouri, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods sold. (Notice of Judgment No. 1206.)
2672	55 barrels vinegar.....	Wisconsin, western district.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1114.)
2678	200 cases evaporated milk.....	Missouri, eastern district.....	Misbranded.....	Libel filed; seizure effected; pending.
2708	80 barrels vinegar.....	Minnesota.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1298.)
2725	100 barrels vinegar.....	Wisconsin, eastern district.....	do.....	Libel filed; seizure effected; pending.
2728	16 cases wine.....	Missouri, eastern district.....	Misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1144.)
2729	28 barrels vinegar.....	Rhode Island.....	Adulterated and misbranded.....	Libel filed; seizure effected; pending. (Notice of Judgment No. 1144.)
2730	40 and 30 sacks corn meal.....	South Carolina.....	do.....	Do.
2730a	50 and 8 sacks corn meal.....	do.....	Misbranded.....	Do.
2732	5 1-gallon bottles lemon extract.....	Illinois, eastern district.....	do.....	Do.

Cases under section 10 of the food and drugs act of June 30, 1906, reported during the fiscal year 1911, and finally determined during the year or pending in the courts at its close—Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of case.
2734	50 cases champagne.....	Ohio, southern district.....	Adulterated and mis- branded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1226.)
2735	73 barrels vinegar.....	Massachusetts.....	Misbranded.....	Decree of condemnation and forfeiture; bond filed. (Notice of Judgment No. 1167.)
2736	50 cases salmon.....	Texas, western district.....	do.....	Libel filed; seizure effected; pending.
2751	4 barrels turpentine.....	Connecticut.....	Adulterated and mis- branded.....	Do.
2769	40 bags oats.....	North Carolina, western district.....	do.....	Do.
2780	10 half-barrels vinegar.....	Mississippi.....	do.....	Do.

SUMMARY.

Decrees of condemnation and forfeiture; goods destroyed.....	139
Decrees of condemnation and forfeiture; goods released on bond.....	100
Seizures effected; pending.....	59
Seizures effected; judgment for claimants; appeal pending.....	3
Seizures effected; discontinued; goods released.....	24
Seizures requested; goods not found.....	12
Total.....	337

Cases reported for criminal prosecution under the food and drugs act, June 30, 1906, prior to the fiscal year 1911, and terminated during the fiscal year 1911.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
79	Nave-McCord Mercantile Co.	Missouri, western district.	Shipment of misbranded "Flavor of lemon and citral" from Missouri to Kansas.	Judgment for the United States reversed by the court of appeals. (Notice of Judgment No. 895.)
274	Nathan Tucker.....	Ohio, southern district.	Shipment of misbranded drug from Ohio to the District of Columbia.	Defendant pleaded not guilty; verdict for Government; defendant fined \$150 and costs. Motion for new trial denied. (Notice of Judgment No. 1077.)
403	Henry L. Hobart & Co.	New York, southern district.	Shipment of misbranded molasses from New York to North Carolina.	Defendant pleaded not guilty; verdict for Government; defendant fined \$100. (Notice of Judgment No. 846.)
498	Merten & Co.....	California, northern district.	Shipment of misbranded lemon extract from California to Montana.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 1264.)
542	Newton Tea & Spice Co.	Ohio, southern district.	Shipment of misbranded pepper from Ohio to Mississippi.	Defendant pleaded nolo contendere; fined \$10 and costs. (Notice of Judgment No. 655.)
558	MacLaren Imperial Cheese Co.	Michigan, eastern district.	Shipment of adulterated cheese from Michigan to Massachusetts.	Defendant pleaded nolo contendere; fined \$5. (Notice of Judgment No. 848.)
561	do.....	do.....	Shipment of adulterated cheese from Michigan to Illinois.	Do.
568	International Milk Products Co.	New York, northern district.	Shipment of adulterated cheese from New York to the District of Columbia.	Defendant pleaded guilty; fined \$125. (Notice of Judgment No. 851.)
625	The Vani-Kola Co....	Ohio, northern district.	Shipment of adulterated and misbranded sirup from Ohio to Michigan.	Defendant pleaded nolo contendere; fined \$25 and costs. (Notice of Judgment No. 935.)
629	Henry L. Hobart & Co.	New York, southern district.	Shipment of misbranded molasses from New York to North Carolina.	Defendant pleaded not guilty; verdict for Government; fined \$100. (Notice of Judgment No. 846; consolidated with F. & D. No. 463.)
654	Jones Bros. & Co.....	Kentucky, western district.	Shipment of adulterated and misbranded vinegar from Kentucky to Mississippi.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 552.)
725	Price & Lucas Cider & Vinegar Co.	do.....	Shipment of adulterated vinegar from Kentucky to Indiana.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 855; consolidated with F. & D. Nos. 846 and 876.)
727	J. Lindsay Wells Co....	Tennessee, western district.	Shipment of adulterated and misbranded cottonseed meal from Tennessee to Indiana.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 794.)
742	Quinine Whiskey Co..	Kentucky, western district.	Shipment of adulterated and misbranded drug product from Kentucky to Illinois.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 885.)
755 1633	North West Mills Co..	Minnesota.....	Shipment of misbranded stock feed from Minnesota to Kentucky.	Defendant pleaded guilty; fined \$75. (Notice of Judgment No. 810.)
753	The Dr. Johnson Remedial Co.	Missouri, western district.	Shipment of misbranded combination treatment for cancer from Missouri to the District of Columbia.	Order of trial court quashing indictment sustained by Supreme Court. (Notice of Judgment No. 1058.)
810	Lucca Olive Oil Importing Co.	New York, southern district.	Shipment of misbranded oil from New York to New Jersey.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 634.)
838	Frank Tea & Spice Co.	Ohio, southern district.	Shipment of adulterated and misbranded pepper from Ohio to Nevada.	Defendant pleaded not guilty; fined \$50 and costs; appeal pending. (Notice of Judgment No. 835.)
846	Price & Lucas Cider & Vinegar Co.	Kentucky, western district.	Shipment of adulterated vinegar from Kentucky to Tennessee.	Case nolle prossed. (Notice of Judgment No. 855.)
848	J. D. Williams & Bro. Co.	Pennsylvania, middle district.	Shipment of misbranded cough drops from Pennsylvania to the District of Columbia.	Verdict of not guilty. (Notice of Judgment No. 1197.)

Cases reported for criminal prosecution under the food and drugs act, June 30, 1906, prior to the fiscal year 1911, and terminated during the fiscal year 1911—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
866	Harbauer-Marleau Co.	Ohio, northern district.	Shipment of adulterated and misbranded vinegar from Ohio to Missouri.	Defendant pleaded nolo; fined \$50; consolidated with F. & D. Nos. 868, 870, 883, 953, 956, 957, 958, 1042. (Notice of Judgment No. 1287.)
868	do.	do.	Shipment of adulterated and misbranded vinegar from Ohio to Illinois.	Defendant pleaded nolo; fined \$50; consolidated with F. & D. Nos. 856, 870, 883, 953, 956, 957, 958, 1042. (Notice of Judgment No. 1287.)
870	do.	do.	Shipment of adulterated and misbranded vinegar from Ohio to Pennsylvania.	Defendant pleaded nolo; fined \$50; consolidated with F. & D. Nos. 856, 868, 883, 953, 956, 957, 958, 1042. (Notice of Judgment No. 1287.)
876	Price & Lucas Cider & Vinegar Co.	Kentucky, western district.	Shipment of adulterated and misbranded vinegar from Kentucky to Indiana.	Case nolle prossed; consolidated with F. & D. Nos. 725 and 846. (Notice of Judgment No. 855.)
879	Cushman & Tujaque Co.	Louisiana, eastern district.	Shipment of adulterated and misbranded olive oil from Louisiana to Florida.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1062.)
883	Harbauer-Marleau Co.	Ohio, northern district.	Shipment of adulterated and misbranded vinegar from Ohio to Indiana.	Defendant pleaded nolo; consolidated with F. & D. Nos. 725 and 846. (Notice of Judgment No. 855.)
882	American Beverage Co.	Missouri, eastern district.	Shipment of adulterated and misbranded ginger ale from Missouri to Kentucky.	Defendant pleaded guilty; fined \$20 and costs; consolidated with F. & D. No. 890. (Notice of Judgment No. 741.)
890	do.	do.	Shipment of adulterated and misbranded coca cream from Missouri to Kentucky.	Defendant pleaded guilty; fined \$20 and costs; consolidated with F. & D. No. 892. (Notice of Judgment No. 741.)
921	O. P. White.	Texas, eastern district.	Shipment of misbranded drug product from Texas to Missouri.	Verdict of guilty; fined \$25. (Notice of Judgment No. 941.)
922	J. B. Edgar Grain Co.	Tennessee, western district.	Shipment of adulterated and misbranded oats from Tennessee to Georgia.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 759.)
935	Acme Milling Co.	Tennessee, eastern district.	Shipment of misbranded stock feed from Tennessee to North Carolina.	Defendant pleaded guilty; fined \$10 and costs; consolidated with F. & D. No. 936. (Notice of Judgment No. 913.)
936	do.	do.	do.	Do.
952	Knadler & Lucas.	Kentucky, western district.	Shipment of adulterated and misbranded vinegar from Kentucky to Arkansas.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 853.)
953	Harbauer-Marleau Co.	Ohio, northern district.	Shipment of adulterated and misbranded vinegar from Ohio to Indiana.	Defendant pleaded nolo contendere; fined \$50; consolidated with F. & D. Nos. 856, 868, 870, 883, 956, 957, 958, 1042. (Notice of Judgment No. 1287.)
956	do.	do.	Shipment of adulterated and misbranded vinegar from Ohio to Michigan.	Defendant pleaded nolo contendere; fined \$50; consolidated with F. & D. Nos. 856, 868, 870, 883, 953, 957, 958, 1042. (Notice of Judgment No. 1287.)
957	do.	do.	Shipment of adulterated and misbranded vinegar from Ohio to West Virginia.	Defendant pleaded nolo contendere; fined \$50; consolidated with F. & D. Nos. 856, 868, 870, 883, 956, 957, 958, 1042. (Notice of Judgment No. 1287.)
958	do.	do.	Shipment of adulterated and misbranded vinegar from Ohio to Illinois.	Defendant pleaded nolo contendere; fined \$50; consolidated with F. & D. Nos. 856, 868, 870, 883, 956, 957, 958, 1042. (Notice of Judgment No. 1287.)
970	Billings, Clapp & Co.	Massachusetts.	Shipment of misbranded drug product from Massachusetts to New Jersey.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 909.)

973	Mountain City Mill Co.	Tennessee, eastern district.	Shipment of misbranded stock feed from Tennessee to North Carolina.	Defendant convicted; fined \$20 and costs. (Notice of Judgment No. 786.)
992	Carpenter-Cook Co.	Michigan, western district.	Shipment of adulterated and misbranded lemon flavoring from Michigan to Wisconsin.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1147.)
995	Stanley K. Pierson.	New York, western district.	Shipment of misbranded drug product from New York to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 708.)
1001	Frank A. Bower.	Massachusetts.	Shipment of misbranded coffee from Massachusetts to Pennsylvania.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 772.)
1006	Wieland Bros.	California, northern district.	Shipment of misbranded cheese from California to Washington.	Verdict of guilty; fined \$50. (Notice of Judgment No. 1148.)
1007	do.	do.	do.	Do.
1015	Alafia Milling Co.	Oklahoma, western district.	Shipment of misbranded stock feed from Oklahoma to Georgia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 808.)
1026	Paul Manufacturing Co.	Massachusetts.	Shipment of adulterated and misbranded orange extract from Massachusetts to the District of Columbia.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 856.)
1029	The E. J. Lyons & Raus Co.	California, northern district.	Shipment of adulterated and misbranded peppermint from California to Arizona.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1247.)
1030	O. F. Woodward.	New York, western district.	Shipment of misbranded headache cure from New York to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 709.)
1032	Lorick & Lowrance.	South Carolina, eastern district.	Shipment of adulterated turpentine from South Carolina to Virginia.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 877.)
1042	Harbauer-Marlean Co.	Ohio, northern district.	Shipment of adulterated and misbranded vinegar from Ohio to Pennsylvania.	Defendant pleaded nolo contendere; fined \$50; consolidated with F. & D. Nos. 856, 868, 870, 883, 953, 957, 958, and 959. (Notice of Judgment No. 1287.)
1055	Paul Manufacturing Co.	Massachusetts.	Shipment of misbranded deodorized germ killer from Massachusetts to the District of Columbia.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 856.)
1057	Ozone Spring Water Co.	Louisiana, eastern district.	Shipment of adulterated and misbranded vichy water from Louisiana to New York.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 876.)
1058	do.	do.	Shipment of adulterated and misbranded vichy water from Louisiana to Kentucky.	Do.
1060	American Beverage Co.	Missouri, eastern district.	Shipment of adulterated and misbranded coca cream from Missouri to Tennessee.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 742.)
1061	do.	do.	Shipment of adulterated and misbranded pepsette from Missouri to Tennessee.	Do.
1062	A. M. Laevison & Co.	Kentucky, western district.	Shipment of adulterated and misbranded Temperine from Kentucky to Tennessee.	Defendant convicted; fined \$50 and costs. (Notice of Judgment No. 834; consolidated with F. & D. Nos. 1063 and 1230.)
1063	do.	do.	Shipment of adulterated and misbranded "Dr. Fizz Special Brew" from Kentucky to Tennessee.	Defendant convicted; fined \$50 and costs; consolidated with F. & D. Nos. 1062 and 1230. (Notice of Judgment No. 834.)
1067	J. L. Hopkins & Co.	New York, southern district.	Shipment of adulterated belladonna root, powdered herbane, powdered gentian root, and powdered cloves-amblyna from New York to New Jersey.	Defendant pleaded guilty; fined \$400. (Notice of Judgment No. 754.)
1072	Cramer Drug Co.	Massachusetts.	Shipment of misbranded drug product from Massachusetts to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 906.)
1077	John D. Langan.	New York, western district.	Shipment of misbranded drug product from New York to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 707.)
1080	American Beverage Co.	Missouri, eastern district.	Shipment of adulterated and misbranded pepsette from Missouri to Kentucky.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 742.)
1081	S. D. Scott & Co.	Virginia, eastern district.	Shipment of adulterated cracked corn from Virginia to North Carolina.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 1204.)
1084	Sharp-Elliott Manufacturing Co.	Arizona.	Shipment of adulterated and misbranded vinegar from Texas to Arizona.	Defendant pleaded guilty; fined \$100.

Cases reported for criminal prosecution under the food and drugs act, June 30, 1906, prior to the fiscal year 1911—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1094	Berry Hill Mineral Spring Co.	Virginia, eastern district.	Shipment of misbranded mineral water from Virginia to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1251.)
1104	Lewis Packing Co....	California, northern district.	Shipment of adulterated and misbranded vinegar from California to Nevada.	Defendant pleaded guilty; fined \$25; consolidated with F. & D. No. 1443. (Notice of Judgment No. 1241.)
1105	W. J. Tucker.....	Georgia, northern district.	Shipment of misbranded drug-habit cure from Georgia to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 693.)
1107	Peck-Johnson Co.....	Michigan, western district.	Shipment of misbranded headache powders from Michigan to Louisiana.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1157.)
1123	Hall Baker Grain Co..	Missouri, western district.	Shipment of adulterated and misbranded wheat from Missouri to Texas.	Verdict of guilty, motion for new trial overruled; fined \$50 and costs; appeal pending. (Notice of Judgment No. 1135.)
1124	Tennessee Fiber Co...	Tennessee, western district.	Shipment of misbranded cottonseed meal from Tennessee to North Carolina.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 755.)
1130	Warner Jenkinson Co.	Missouri, eastern district.	Shipment of adulterated and misbranded apple phosphate from Missouri to Alabama.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 796.)
1152	W. A. Starnes.....	Georgia, northern district.	Shipment of misbranded drug-habit cure from Georgia to the District of Columbia.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 694.)
1159	California Fruit Canners Association.	California, northern district.	Shipment of adulterated cherry jam from California to Utah.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1235.)
1162	California Perfume Co.	New York, southern district.	Shipment of adulterated and misbranded lemon extract from New York to Kentucky.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1229.)
1165	Lopez Remedy Co. & John A. Riggs.	Arkansas, eastern district.	Shipment of misbranded drug product from Arkansas to Missouri.	Verdict for defendant by direction of the court. (Notice of Judgment No. 816.)
1168	California Fruit Canners Association.	California, northern district.	Shipment of adulterated jelly from California to Utah.....	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1235.)
1172	W. H. Hutchinson & Son.	Illinois, northern district.	Shipment of adulterated and misbranded "soda water syrup cola" from Illinois to Missouri.	Jury returned verdict of not guilty. (Notice of Judgment No. 1031.)
1173	Western Candy & Bakers Supply Co.	Missouri, eastern district.	Shipment of adulterated and misbranded flavoring extracts from Missouri to Illinois.	Defendant pleaded guilty; fined \$60 and costs. (Notice of Judgment No. 739.)
1180	The Great Atlantic & Pacific Tea Co.	New Jersey.....	Shipment of adulterated and misbranded flavoring extract from New Jersey to Texas.	Nolle prossed.
1183	Frederick Stearns & Co.	Michigan, eastern district.	Shipment of misbranded drug product from Michigan to Illinois.	Defendant pleaded nolo contendere; fined \$2. (Notice of Judgment No. 903.)
1199	American Druggists Syndicate.	New York, eastern district.	Shipment of misbranded peroxide cream from New York to the District of Columbia.	Information filed, demurrer sustained. (Notice of Judgment No. 1194.)
1223	International Sugar Feed Co.	Minnesota.....	Shipment of misbranded feed from Minnesota to Illinois.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 691.)
1224	A. De Claremont Co..	New York, southern district.	Shipment of misbranded liqueur from New York to Massachusetts.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 746.)
1227	Independent Distilling Co.	Missouri, western district.	Shipment of adulterated and misbranded port wine from Missouri to Kansas.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 824.)
1230	A. M. Laevison & Co...	Kentucky, western district.	Shipment of adulterated and misbranded cream ale from Kentucky to Tennessee.	Defendant convicted; fined \$50 and costs; consolidated with F. & D. Nos. 1002 and 1003. (Notice of Judgment No. 894.)

1243	Armour & Co.	District of Columbia. . .	Sale in the District of Columbia of adulterated eggs.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 675.)
1251	E. G. Lyons & Raas Co.	California, northern district.	Shipment of adulterated and misbranded blackberry cordial from California to Washington.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1247.)
1254	Warner-Jenkinson Co.	Missouri, eastern district.	Shipment of adulterated and misbranded "Red Seal" cola queen sirup from Missouri to Ohio.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 785.)
1258	Frank Tea & Spice Co.	Ohio, southern district.	Shipment of adulterated and misbranded lemon extract from Ohio to Kentucky.	Defendant pleaded guilty; fined \$200 and costs. (Notice of Judgment No. 823.)
1272	Goetzman Bros.	Missouri, eastern district.	Shipment of adulterated and misbranded vanilla flavor from Missouri to Illinois.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 922.)
1276	J. M. Bour Co.	Ohio, northern district.	Shipment of adulterated and misbranded coffee from Ohio to Illinois.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 928.)
1281	Henry Sloan Co.	New York, western district.	Shipment of adulterated frozen eggs from New York to Massachusetts.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 730.)
1289	Huber & Fuhrman Drug Mills.	Wisconsin, eastern district.	Shipment of adulterated and misbranded tragacanth from Wisconsin to Virginia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 998.)
1293	Western Candy & Bakers Supply Co.	Missouri, eastern district.	Shipment of adulterated and misbranded flavoring extracts from Missouri to Illinois.	Defendant pleaded guilty; fined \$40 and costs; consolidated with F. & D. No. 1173. (Notice of Judgment No. 739.)
1295	Robert B. Brown Oil Co.	.....do.	Shipment of misbranded linseed meal from Missouri to Illinois.	Defendant pleaded guilty; fined \$1 and costs. (Notice of Judgment No. 728.)
1301	St. Louis Syrup & Preserving Co.	.....do.	Shipment of adulterated and misbranded jam from Missouri to Oklahoma.	Defendant pleaded guilty; fined \$40 and costs. Notice of Judgment No. 698.)
1302	Logan & Co.	Tennessee, middle district.	Shipment of adulterated and misbranded oats from Tennessee to Georgia.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 1171.)
1314	Great Atlantic & Pacific Tea Co.	New Jersey.	Shipment of adulterated and misbranded strawberry extract from New Jersey to Texas.	Nolle prossed.
1318	W. F. McLaughlin & Co.	Illinois, northern district.	Shipment of misbranded coffee from Illinois to Kansas.	Court entered finding of not guilty. (Notice of Judgment No. 1112.)
1325	B. H. Townsend & Co.	Utah.	Shipment of adulterated and misbranded lemon extract from Utah to Idaho.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 807.)
1339	Asthma Remedy & Manufacturing Co.	Georgia, northern district.	Shipment of misbranded drug product from Georgia to Utah.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 727.)
1344	S. Gumpert & Co.	New York, southern district.	Shipment of misbranded flavoring extracts from New York to Texas.	Verdict of guilty; fined \$400; consolidated with F. & D. Nos. 1416, 1742, and 1841. (Notice of Judgment No. 806.)
1348	Chas. W. Mixer.	Michigan, western district.	Shipment of misbranded drug product from Michigan to the District of Columbia.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 797.)
1349	Empire State Wine Co.	.....do.	Shipment of misbranded wine from New York to Massachusetts.	Defendant pleaded guilty; fined \$100. (Notice of Judgment No. 711.)
1359	St. Louis Coffee & Spice Mills.	New York, western district.	Shipment of misbranded flavoring extract from Missouri to Kansas.	Defendant pleaded nolo contendere; fined \$5 and costs. (Notice of Judgment No. 1099.)
1365	Cobb Manufacturing Co.	Virginia, eastern district.	Shipment of adulterated and misbranded pepper from Virginia to North Carolina.	Fined \$25 and costs. (Notice of Judgment No. 1257.)
1368	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of adulterated and misbranded sirup from Missouri to Texas.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 699.)
1371	Munyon Homeopathic Home Remedy Co.	Pennsylvania, eastern district.	Shipment of misbranded drugs from Pennsylvania to Massachusetts.	Nolle prossed.
1376	W. D. Huffman Co.	Indiana.	Shipment of misbranded jelly from Indiana to Illinois.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1207.)
1377	Warner-Jenkinson Co.	Missouri, eastern district.	Shipment of adulterated and misbranded drug from Missouri to Michigan.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 784.)
1383	Munyon Homeopathic Home Remedy Co.	Pennsylvania, eastern district.	Shipment of misbranded asthma cure from Pennsylvania to the District of Columbia.	Defendant pleaded guilty; fined \$200. (Notice of Judgment No. 874.)

Cases reported for criminal prosecution under the food and drugs act, June 30, 1906, prior to the fiscal year 1911, and terminated during the fiscal year 1911—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1385	Straus, Gunst & Co....	Virginia, eastern district.	Shipment of misbranded gin from Virginia to the District of Columbia.	Fined \$25 and costs. (Notice of Judgment No. 1255.)
1387	Munyon's Homeopathic Home Remedy Co.	Pennsylvania, eastern district.	Shipment of misbranded "Blood cure" and special liquid blood cure from Pennsylvania to New Jersey.	Defendant pleaded guilty; fined \$400. (Notice of Judgment No. 874.)
1396	D. Rothschild Grain Co.	Iowa, southern district	Shipment of adulterated and misbranded oats from Iowa to Arkansas.	Defendant pleaded guilty; fined \$50. (Notice of Judgment No. 1208.)
1400	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of adulterated and misbranded preserved peaches from Missouri to Texas.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 700.)
1405	Bell & Co.....	New York, southern district.	Shipment of misbranded drug from New York to Ohio....	Nolle prossed.
1406	Allaire, Woodward & Co.	Illinois, southern district.	Shipment of adulterated and misbranded ground kamala from Illinois to California.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1011.)
1415	Alart & McGuire.....	New York, southern district.	Shipment of adulterated tomato catsup from New York to Louisiana.	Defendant pleaded guilty; fined \$100; consolidated with F. & D. No. 2199. (Notice of Judgment No. 921.)
1416	S. Gumpert & Co.....	.....do.....	Shipment of misbranded flavoring extracts from New York to Texas.	Verdict of guilty; fined \$400; consolidated with F. & D. Nos. 1344, 1742, and 1841. (Notice of Judgment No. 806.)
1417	Gordon Syrup Co.....	California, northern district.	Shipment of misbranded sirup from California to Arizona..	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1240.)
1425	Italian Importing Co..	New York, southern district.	Shipment of misbranded olive oil from New York to Oregon.	Defendant convicted; fined \$50. (Notice of Judgment No. 832.)
1426	California Fruit Canners' Association.	California, northern district.	Shipment of adulterated tomato catsup from California to Arizona.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1235.)
1429	Liebenthal Bros. & Co.	Ohio, northern district	Shipment of adulterated and misbranded flavoring extracts from Ohio to Colorado.	Defendant pleaded nolo contendere; fined \$50 and costs; consolidated with 1467. (Notice of Judgment No. 936.)
1430	Cheney Medicine Co....	.....do.....	Shipment of misbranded drug product from Ohio to the District of Columbia.	Nolle prossed.
1431	E. C. Flaccus Co.....	West Virginia, northern district.	Shipment of misbranded currant preserves from West Virginia to Maryland.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1081.)
1432	P. H. Sugrue & Co....	Ohio, northern district	Shipment of adulterated and misbranded vinegar from Ohio to Pennsylvania.	Defendant pleaded nolo contendere; fined \$25 and costs. (Notice of Judgment No. 917.)
1433	Paul Manufacturing Co.	Massachusetts.....	Shipment of adulterated and misbranded vanilla extract from Massachusetts to Michigan.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 842.)
1434	Patton-Worsham Drug Co.	Texas, northern district.	Shipment of misbranded Oxoline from Tennessee to Georgia.	Verdict for defendant. (Notice of Judgment No. 1035.)
1436	J. M. Jackson.....	New Hampshire.....	Shipment of adulterated milk from New Hampshire to Massachusetts.	Defendant pleaded nolo contendere; fined \$10.
1437	H. E. Spaulding.....	.....do.....	.....do.....	Do.
1438	W. E. Hopkins.....	.....do.....	.....do.....	Do.
1439	Almond Hill.....	.....do.....	.....do.....	Do.
1440	W. C. Wilder.....	.....do.....	.....do.....	Do.

1441	George Ycaton.....	do.....	Shipment of adulterated and misbranded catsup from California to Oregon.	Do. Defendant pleaded guilty; fined \$25; consolidated with F. & D. No. 104.
1442	George Blanch.....	do.....	Shipment of misbranded maraschino cherries from Kentucky to New York.	Defendant pleaded nolo contendere; fined \$5. (Notice of Judgment No. 912.)
1443	Lewis Packing Co.....	do.....	Shipment of adulterated and misbranded lemon extracts from Ohio to Kentucky.	Defendant pleaded nolo contendere; fined \$50 and costs; consolidated with F. & D. Nos. 1470, 1472, 1473, and 1493. (Notice of Judgment No. 939.)
1445	I. Rheinstrom & Sons Co.....	do.....	Shipment of misbranded grape juice from Ohio to Colorado.	Defendant pleaded nolo contendere; fined \$25.
1460	Bruce & West Manufacturing Co.....	do.....	Shipment of adulterated and misbranded vanilla extract from Missouri to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 868.)
1462	Bass Island Vineyards Co.....	do.....	Shipment of adulterated and misbranded vanilla extract from Ohio to Kentucky.	Defendant pleaded nolo contendere; fined \$50 and costs; consolidated with F. & D. No. 1429. (Notice of Judgment No. 936.)
1466	Alfalfa Milling Co.....	Oklahoma, western district.	Shipment of adulterated and misbranded blackberry preserves from Missouri to Texas.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 740.)
1467	Liebethal Bros. & Co.....	Ohio, northern district.	Shipment of adulterated and misbranded lemon extract from Ohio to Michigan.	Defendant pleaded nolo contendere; fined \$50 and costs; consolidated with F. & D. Nos. 1460, 1472, 1473, and 1493. (Notice of Judgment No. 939.)
1469	Shepard Baking Powder Co.....	Missouri, eastern district.	Shipment of adulterated and misbranded strawberry preserves from Missouri to Texas.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 701.)
1470	Bruce & West Manufacturing Co.....	Ohio, northern district.	Shipment of adulterated and misbranded lemon extract from Ohio to Michigan.	Defendant pleaded nolo contendere; fined \$50 and costs; consolidated with F. & D. Nos. 1473, 1460, 1470, and 1493. (Notice of Judgment No. 939.)
1471	St. Louis Syrup & Preserving Co.....	Missouri, eastern district.	Shipment of adulterated and misbranded strawberry extract from Ohio to Kentucky.	Do.
1472	Bruce & West Manufacturing Co.....	Ohio, northern district.	Shipment of adulterated and misbranded strawberry extract from Ohio to Kentucky.	Jury rendered a verdict of not guilty. (Notice of Judgment No. 1192.)
1473	do.....	do.....	Shipment of adulterated and misbranded strawberry extract from Ohio to Kentucky.	Fined \$25 and costs. (Notice of Judgment No. 1256.)
1476	G. F. Decker & Co.....	Rhode Island.....	Shipment of adulterated oysters from Rhode Island to Massachusetts.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1247.)
1483	Wallerstein Produce Co.....	Virginia, eastern district.	Shipment of adulterated and misbranded evaporated apples from Virginia to Ohio.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 952.)
1484	E. G. Lyons & Rans Co.....	California, northern district.	Shipment of adulterated and misbranded blackberry cordial from California to Oregon.	Defendant pleaded nolo contendere; fined \$50 and costs; consolidated with F. & D. Nos. 1460, 1470, 1472, and 1473. (Notice of Judgment No. 939.)
1491	Goodwin Preserving Co.....	Kentucky, western district.	Shipment of misbranded preserves from Kentucky to Arkansas.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 732.)
1493	Bruce & West Manufacturing Co.....	Ohio, northern district.	Shipment of adulterated and misbranded lemon extract from Ohio to Kentucky.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 758.)
1495	Dodson-Brain Manufacturing Co.....	Missouri, eastern district.	Shipment of adulterated tomato catsup from Missouri to Texas.	Defendant pleaded guilty; fined \$2 and costs; consolidated with F. & D. 1553. (Notice of Judgment No. 738.)
1496	J. Lindsay Wells Co.....	Tennessee, western district.	Shipment of misbranded cottonseed meal from Tennessee to Indiana.	Defendant pleaded guilty; fined \$5; consolidated with F. & D. No. 1555. (Notice of Judgment No. 1212.)
1497	Meyer Bros. Drug Co.....	Missouri, eastern district.	Shipment of adulterated and misbranded raspberry extracts from Missouri to Michigan.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 702.)
1498	Wellman, Peck & Co.....	California, northern district.	Shipment of adulterated and misbranded raspberry extract from California to Nevada.	Defendant pleaded guilty; sentence suspended. (Notice of Judgment No. 819.)
1503	St. Louis Syrup & Preserving Co.....	Missouri, eastern district.	Shipment of adulterated and misbranded apple butter from Missouri to Kentucky.	
1506	A. Flore & Co.....	New York, southern district.	Shipment of misbranded olive oil from New York to New Jersey.	

Cases reported for criminal prosecution under the food and drugs act, June 30, 1906, prior to the fiscal year 1911, and terminated during the fiscal year 1911—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1507	Leroux Cider & Vinegar Co.	Ohio, northern district.	Shipment of adulterated and misbranded vinegar from Michigan to Indiana.	Nolle prossed.
1508	J. Lindsay Wells Co.	Tennessee, western district.	Shipment of adulterated and misbranded cottensed meal from Tennessee to North Carolina.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 750.)
1510	F. Carrao & Co.	New York, southern district.	Shipment of adulterated and misbranded olive oil from New York to Massachusetts.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1155.)
1512	F. E. Rosebrook & Co.	do.	Shipment of adulterated frozen eggs from New York to New Jersey.	Verdict of guilty; fined \$200. (Notice of Judgment No. 825.)
1513	William Edwards Co.	Ohio, northern district.	Shipment of misbranded lemon flavor from Ohio to Michigan.	Defendant pleaded nolo contendere; fined \$25 and costs. (Notice of Judgment No. 918.)
1514	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of adulterated and misbranded apple butter from Missouri to Oklahoma.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 702.)
1517	W. F. Chamberlain Feed Co.	do.	Shipment of misbranded chick feed from Missouri to Illinois.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 729.)
1518	H. C. Kenison.	New Hampshire.	Shipment of adulterated milk from New Hampshire to Massachusetts.	Defendant pleaded nolo contendere; fined \$10.
1519	C. A. Hills Grove.	do.	do.	Do.
1520	C. Jowders.	do.	Shipment of misbranded vanilla extract from Ohio to Kentucky.	Defendant pleaded nolo contendere; fined \$50 and costs. (Notice of Judgment No. 1289.)
1521	Bruce & West Manufacturing Co.	Ohio, northern district.	Shipment of misbranded cottonseed meal from Tennessee to Indiana.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 751.)
1522	J. Lindsay Wells Co.	Tennessee, western district.	Shipment of misbranded drug product from California to Texas.	Demurrer of defendant sustained.
1528	Hygienic Health Food Co.	California, northern district.	Shipment of misbranded "Kopp's Baby's Friend" from Pennsylvania to New York.	Defendant pleaded nolo contendere; fined \$15 and costs. (Notice of Judgment No. 1068.)
1529	Mrs. J. A. Kopp.	Pennsylvania, middle district.	Shipment of adulterated and misbranded apple preserves from Missouri to Kentucky.	Defendant pleaded guilty; fined \$60 and costs. (Notice of Judgment No. 703.)
1533	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of adulterated and misbranded tomato catsup from Ohio to Illinois.	Defendant pleaded nolo contendere; fined \$25 and costs. (Notice of Judgment No. 1095.)
1534	Leroux Cider & Vinegar Co.	Ohio, northern district.	Shipment of adulterated and misbranded tomato catsup from California to Texas.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1235.)
1536	California Fruit Canners Association.	California, northern district.	Shipment of adulterated and misbranded tomato catsup from Ohio to Maryland.	Defendant pleaded nolo contendere; fined \$25 and costs; consolidated with No. 1542. (Notice of Judgment No. 937.)
1541	Pressing & Orr Co.	Ohio, northern district.	Shipment of adulterated and misbranded tomato catsup from Ohio to Iowa.	Defendant pleaded nolo contendere; fined \$25 and costs; consolidated with No. 1541. (Notice of Judgment No. 937.)
1542	do.	do.	Shipment of adulterated and misbranded tomato catsup from Ohio to Iowa.	Defendant pleaded guilty; fined \$20 and costs. (Notice of Judgment No. 702.)
1545	St. Louis Syrup & Preserving Co.	Missouri, eastern district.	Shipment of adulterated and misbranded apple butter from Missouri to Oklahoma.	Defendant pleaded guilty; fined \$80 and costs. (Notice of Judgment No. 904.)
1548	Kansas City Preserving Co.	Missouri, western district.	Shipment of adulterated and misbranded tomato catsup from Missouri to Kansas.	Defendant pleaded guilty; fined \$2 and costs; consolidated with F. & D. No. 1497. (Notice of Judgment No. 738.)
1553	Meyer Bros. Drug Co.	Missouri, eastern district.	Shipment of adulterated and misbranded flavoring extracts from Missouri to Michigan.	

1554	Charles Denmyer.....	Louisiana, eastern district.	Shipment of adulterated and misbranded lemon flavor from Louisiana to Texas.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1188.)
1555	Wellman, Peck & Co....	California, northern district.	Shipment of adulterated and misbranded fruit flavor from California to Nevada.	Defendant pleaded guilty; fined \$5; consolidated with F. & D. No. 1498. (Notice of Judgment No. 1212.)
1557	Mrs. Gervais Graham.	Illinois, northern district.	Shipment of misbranded drug product from Illinois to Tennessee.	Defendant pleaded guilty; fined \$50 and costs. (Notice of Judgment No. 715.)
1558	German Medicine Co.....	Massachusetts.	Shipment of misbranded drug product from Massachusetts to New York.	Defendant pleaded nolo contendere; information placed on file. (Notice of Judgment No. 902.)
1559	Uncle Sam Breakfast Food Co.	Nebraska.	Shipment of misbranded food product from Nebraska to Ohio.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 865.)
1563	Mountain City Mill Co.	Tennessee, eastern district.	Shipment of adulterated and misbranded feed meal from Tennessee to North Carolina.	Defendant convicted; fined \$25 and costs.
1566	California Fruit Canners' Association.	California, northern district.	Shipment of adulterated and misbranded jam from California to Arizona.	Grand jury failed to indict.
1568	B. T. Chandler & Son.	Illinois, northern district.	Shipment of adulterated and misbranded vinegar, Illinois to Indiana.	Defendant pleaded guilty; fined \$100 and costs. (Notice of Judgment No. 653.)
1569	Crandall, Pettie Co....	New York, southern district.	Shipment of misbranded lemon flavor, New York to North Carolina.	Defendant pleaded guilty; fined \$5. (Notice of Judgment No. 684.)
1570	J. Allen Smith & Co....	Tennessee, eastern district.	Shipment of misbranded cattle feed, Tennessee to Virginia.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1141.)
1571	R. C. Williams & Co..	New York, southern district.	Shipment of misbranded vanilla extract, New York to Michigan.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 692.)
1579	Muth Bros. & Co.....	Maryland.	Shipment of adulterated and misbranded drug product, "Pink Root," Maryland to Virginia.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 901.)
1581	Giuliana Grocery Co....	New Jersey.	Shipment of adulterated and misbranded olive oil, New Jersey to New York.	Nolle prossed.
1582	A. Grossenbach Co.....	Wisconsin, eastern district.	Shipment of adulterated frozen eggs, Wisconsin to Massachusetts.	Defendant pleaded nolo contendere; fined \$25. (Notice of Judgment No. 938.)
1583	Ulmann, Dreifus & Co.	Ohio, southern district.	Shipment of adulterated and misbranded lemon flavor, Ohio to Michigan.	Defendant pleaded nolo contendere; fined \$25 and costs. (Notice of Judgment No. 689.)
1584	Holland Medicine Co....	Pennsylvania, middle district.	Shipment of misbranded drug product, Pennsylvania to New Jersey.	Defendant pleaded nolo contendere; fined \$10 and costs. (Notice of Judgment No. 987.)
1590	Morris-Morton Drug Co.	Arkansas, western district.	Shipment of misbranded drug product, Arkansas to Tennessee.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 1178.)
1593	St. Louis Crystals Egg Co.	Missouri, eastern district.	Shipment of adulterated desiccated egg product, Missouri to Massachusetts.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 747.)
1596	A. Finke's Widow....	California, northern district.	Shipment of misbranded champagne, California to Washington.	Defendant convicted; fined \$200. (Notice of Judgment No. 1020.)
1597	do.	do.	do.	Do.
1598	The E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded creme de cacao, California to Arizona.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1247.)
1601	A. Finke's Widow....	California, northern district.	Shipment of misbranded champagne, California to Washington.	Defendant convicted; fined \$200. (Notice of Judgment No. 1020.)
1599	Infalible Headache Tablet Co.	Pennsylvania, middle district.	Shipment of misbranded drug product, Pennsylvania to Massachusetts.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 919.)
1600	Crown Manufacturing Co.	New York, southern district.	Shipment of misbranded vanilla, New York to New Jersey.	Defendant pleaded guilty; fined \$15. (Notice of Judgment No. 640.)
1610	S. Viviano & Bros.....	Missouri, eastern district.	Shipment of misbranded olive oil, Missouri to Illinois.	Defendant pleaded guilty; fined \$5 and costs. (Notice of Judgment No. 783.)

Cases reported for criminal prosecution under the food and drugs act, June 30, 1906, prior to the fiscal year 1911, and terminated during the fiscal year 1911—Continued.

F. & D. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition or present status of case.
1611	The E. G. Lyons & Raas Co.	California, northern district.	Shipment of misbranded champagne, California to Colo- rado.	Defendant pleaded guilty; fined \$25. (Notice of Judgment No. 1247.)
1617	Colorado Canning Co...	Colorado.....	Shipment of adulterated and misbranded fruit jellies, Colo- rado to New Mexico.	Defendant pleaded guilty; fined \$10 and costs. (Notice of Judgment No. 811.)
1622	McMechen Preserving Co.	West Virginia, north- ern district.	Shipment of adulterated tomato catsup, West Virginia to Pennsylvania.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1080.)
1624	Semrad Chemical Co...	Illinois, northern dis- trict.	Shipment of adulterated and misbranded vanilla and tonka, Illinois to Texas.	Defendant pleaded guilty; fined \$100 and costs. (Notice of Judgment No. 659.)
1628	Sterling Remedy Co...	West Virginia, north- ern district.	Shipment of misbranded chewing gum, West Virginia to New York.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1075.)

SUMMARY.

Terminated in favor of the Government.....	161
Terminated in favor of the defendant.....	7
Pending on appeal.....	2
Nolle prossed.....	7
Grand jury returned no indictment.....	1
Total.....	178

Cases under section 10 of the food and drugs act of June 30, 1906, reported prior to the fiscal year 1911, and finally determined during the fiscal year 1911.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of the case.
235	42 cases cheese.....	District of Columbia.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 790.)
451	80 barrels vinegar.....	West Virginia, northern district.....	Misbranded.....	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 720.)
474	1 carload "Corno horse and mule feed".....	Alabama, middle district.....	Misbranded and adulterated.....	Judgment for the claimant; libel dismissed. (Notice of Judgment No. 990.)
500	50 cans preserved whole eggs.....	Utah.....	Adulterated.....	Judgment of trial court approved by Supreme Court. (Notice of Judgment No. 1043.)
523	54 cases blackberries.....	Ohio.....	Misbranded.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1154.)
544	46 bags sugar.....	Ohio.....	Adulterated and misbranded.....	Judgment for claimants; libel dismissed. (Notice of Judgment No. 723.)
573	8 packages drug products.....	Ohio, southern district.....	Misbranded.....	Judgment for claimants; libel dismissed. (Notice of Judgment No. 697.)
641	70 tubs butter.....	Massachusetts.....	Adulterated.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 812.)
649	1 barrel dried egg product.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 859.)
680	75 barrels vinegar.....	Nebraska.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 626.)
831	205 barrels vinegar.....	Pennsylvania, northern district.....	do.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1193.)
836	74 cheeses.....	Florida, southern district.....	Misbranded.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1183.)
867	98 cheeses.....	do.....	do.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1186.)
902	20 half barrels sirup.....	do.....	do.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1187.)
974	3 cases olive oil.....	Georgia, northern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 710.)
1016	2,000 cases canned tomatoes.....	Texas, northern district.....	do.....	Judgment of trial court for Government affirmed by Circuit Court of Appeals. (Notice of Judgment No. 875.)
1040	3 barrels gin.....	Louisiana, northern district.....	Misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1089.)
1140	50 boxes cheese.....	West Virginia, southern district.....	do.....	Decree of condemnation and forfeiture; goods released under bond.
1145	195 cases, 55 jackets, and 9 cases maple sirup.....	California, southern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 928.)
1163	5 and 9 boxes asafetida.....	Pennsylvania, eastern district.....	Adulterated.....	Judgment for claimants; libels dismissed. (Notice of Judgment No. 884.)
1171	5 barrels olives.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 647.)
1188	275 cases tomato catsup.....	Ohio, southern district.....	do.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1044.)

Cases under section 10 of the food and drugs act of June 30, 1906, reported prior to the fiscal year 1911, and finally determined during the fiscal year 1911—
Continued.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of the case.
1189	1 barrel vanilla extract.....	Texas, southern district.....	Misbranded.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1166.)
1252	33 cases lithia water.....	District of Columbia.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 822.)
1260	1 barrel desiccated egg product.....	Virginia, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture. (Notice of Judgment No. 1174.)
1260a	do.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1185.)
1261	1 box desiccated egg product.....	do.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1143.)
1288	25 cases sugar cream.....	Missouri, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released under bond.
1321	74 cases grape juice.....	New York, northern district.....	do.....	Decision for claimant affirmed by circuit court of appeals. (Notice of Judgment No. 1045.)
1351	25 boxes dragees.....	Michigan, eastern district.....	Adulterated.....	Discontinued.
1352	Consignment of oats.....	Louisiana, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1230.)
1362	95 sacks corn meal.....	North Carolina, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1198.)
1366	100 barrels vinegar.....	Minnesota.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 927.)
1384	100 sacks corn meal.....	North Carolina, eastern district.....	do.....	Decree of condemnation and forfeiture; goods released under bond.
1389	625 sacks flour.....	Missouri, western district.....	do.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 722.)
1398	1,200 sacks flour.....	Tennessee, middle district.....	Adulterated.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 799.)
1427	247 cans of grape juice.....	Colorado.....	Misbranded.....	Decree of condemnation and forfeiture; goods released under bond.
1464	100 cases and 31 barrels catsup.....	Louisiana, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods released under bond. (Notice of Judgment No. 1195.)
1475	2 barrels egg product.....	Massachusetts.....	do.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1108.)
1535	50 barrels vinegar.....	Wisconsin, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released on bond. (Notice of Judgment No. 1059.)
1556	2 drums desiccated egg product.....	Louisiana, eastern district.....	Adulterated.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1074.)
1591	100 cases tomato puree.....	do.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods destroyed. (Notice of Judgment No. 1106.)

1592	192 cases tomato pulp.....	.....do.....	Adulterated.....	Decree of condemnation and forfeiture; (Notice of Judgment No. 1107.)	goods destroyed.
1602	48 boxes whole eloxes.....	Georgia, northern district.....	Misbranded.....	Decree of condemnation and forfeiture; bond. (Notice of Judgment No. 1204.)	goods released on
1608	12 boxes and 5 boxes sugar and maple sugar.....	Michigan, eastern district.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; bond. (Notice of Judgment No. 1101.)	goods released on
1620	542 sacks corn bran.....	Tennessee, western district.....	Adulterated.....	Decree of condemnation and forfeiture; (Notice of Judgment No. 1071.)	goods destroyed.
1629	812 cases sardines.....	Mississippi, northern district.....	.....do.....	Discontinued.	

SUMMARY.

Decrees of condemnation and forfeiture; goods destroyed.....	11
Decrees of condemnation and forfeiture; goods released on bond.....	27
Judgments for claimants.....	4
Decision of appellate courts for claimants.....	1
Decisions of appellate courts for Government.....	2
Discontinued.....	2

Cases under section 2 of the food and drugs act of June 30, 1906, reported to United States attorneys by collaborators of the department and finally determined during the fiscal year 1911.

F. & D. case No.	Defendants.	Judicial district.	Charge.	Disposition or present status of the case.
79c	John G. Reed and John T. Brosius.	District of Columbia.	Sale of adulterated milk in Dis- trict of Columbia.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 867.)
83c	Thomas E. Knott.	do.	Adulterated milk, Maryland to District of Columbia.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 753.)
84c	George A. Wilson.	do.	Shipment of adulterated milk, Maryland to District of Colum- bia.	Defendant pleaded guilty; fined \$15 and costs. (Notice of Judgment No. 719.)
86c	Charles G. Wilson.	do.	do.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 787.)
87c	George A. Wilson.	do.	do.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 788.)
88c	J. Lindsay Wells Co.	Tennessee, western district.	Shipment of misbranded cotton- seed meal, Tennessee to Ken- tucky.	Defendant pleaded guilty; fined \$25 and costs. (Notice of Judgment No. 798.)
89c	Frank H. Markell.	District of Columbia.	Sale of adulterated milk in Dis- trict of Columbia.	Defendant pleaded guilty; fined \$30. (Notice of Judgment No. 847.)
91c	Geo. H. Barnesley.	do.	do.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1136.)
97c	G. H. Bayliss.	do.	do.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1137.)
99c	C. C. Mainhart.	do.	Sale of adulterated cream in Dis- trict of Columbia.	Defendant pleaded guilty; fined \$20. (Notice of Judgment No. 1138.)
100c	B. F. Zimmerman.	do.	Sale of adulterated milk in Dis- trict of Columbia.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1131.)
101c	C. A. Walter.	do.	do.	Defendant pleaded guilty; fined \$15. (Notice of Judgment No. 1132.)
102c	W. C. Null.	do.	do.	Defendant pleaded guilty; fined \$15. (Notice of Judgment No. 1133.)
103c	W. H. Orm, jr.	do.	do.	Defendant pleaded guilty; fined \$10. (Notice of Judgment No. 1134.)

Cases under section 10 of the food and drugs act of June 30, 1906, reported to United States attorneys by collaborators of the department during the fiscal year 1911.

F. & D. case No.	Article.	Judicial district.	Charge.	Disposition or present status of the case.
32c	1 carload of vinegar.....	Kansas.....	Adulterated and misbranded.....	Decree of condemnation and forfeiture; goods released under bond.
90c	26 cases cheese.....	Indiana.....	Misbranded.....	Libel filed; seizure effected; pending.
98c	20 cans and 9 cases molasses.....	North Dakota.....	Adulterated and misbranded.....	Do.
107c	1 ear of wheat.....	Texas, northern.....	do.....	Decree of condemnation and forfeiture; goods released on bond.

Summary of suits under the twenty-eight hour law resulting in judgment for the Government during the fiscal year from July 1, 1910, to June 30, 1911.

Case No.	Railroad involved	Judicial district.	Penalty assessed.	Costs assessed.
1470	Atchison, Topeka & Santa Fe.....	Kansas.....	\$300.00	\$117.00
1531	do.....	do.....	300.00	
1572	do.....	do.....	300.00	
1781	do.....	do.....	100.00	
1841	do.....	Oklahoma, western district.....	100.00	53.34
1842	do.....	do.....	100.00	110.40
1912	do.....	do.....	100.00	1.00
1921	do.....	Kansas.....	100.00	17.50
1947	do.....	Missouri, western district.....	100.00	19.17
1948	do.....	Illinois, northern district.....	100.00	18.66
2131	do.....	do.....	100.00	18.66
2148	do.....	New Mexico.....	100.00	33.50
2149	do.....	Colorado.....	150.00	30.50
2167			150.00	
2168			100.00	
2197		do.....	100.00	
2221	do.....	Oklahoma, western district.....	100.00	23.95
2305	do.....	do.....	100.00	20.35
2324	do.....	do.....	100.00	1.50
2446	do.....	do.....	100.00	27.45
965	Atlantic Coast Line.....	Kansas.....	100.00	1.50
1017	Baltimore & Ohio Southwestern.....	New Mexico.....	100.00	17.55
1018	do.....	Virginia, eastern district.....	100.00	16.80
2099	do.....	Ohio, southern district.....	100.00	37.45
2700	do.....	do.....	100.00	25.50
551	do.....	do.....	100.00	26.20
552	do.....	do.....	100.00	19.12
553	do.....	do.....	100.00	42.10
554	do.....	do.....	100.00	24.00
556	do.....	do.....	100.00	24.00
557	do.....	do.....	100.00	22.90
644	do.....	do.....	100.00	24.00
651	do.....	do.....	100.00	23.26
652	do.....	do.....	100.00	27.95
660	do.....	do.....	100.00	23.75
987	do.....	do.....	100.00	23.40
992	do.....	do.....	100.00	25.60
993	do.....	do.....	100.00	23.60
1908	Chicago & Northwestern.....	South Dakota.....	100.00	25.45
1991	do.....	Iowa, southern district.....	100.00	95.32
1994				13.68
1997				
1998				
1994	do.....	Iowa, northern district.....	100.00	16.40
1995	do.....	do.....	100.00	14.56
2004	do.....	do.....	100.00	14.50
2030	do.....	Nebraska.....	100.00	26.26
2031				
2034	do.....	do.....	100.00	
2035	do.....	Minnesota.....	100.00	19.46
2036				
2049	do.....	Iowa, northern district.....	100.00	14.56
2061	do.....	do.....	100.00	14.56
2067	do.....	Nebraska.....	100.00	21.77
2068				
2069	do.....	do.....	200.00	21.67
2108	do.....	Minnesota.....	250.00	19.36
2109	do.....	do.....	150.00	19.36
2111	do.....	do.....	100.00	15.15
2132	do.....	Illinois, northern district.....	100.00	15.15
2133	do.....	do.....	100.00	15.15
2134	do.....	do.....	100.00	15.15
2220	do.....	do.....	100.00	15.00
2246	do.....	do.....	100.00	15.00
2267	do.....	do.....	100.00	18.85
2268	do.....	do.....	100.00	15.15
2276	do.....	do.....	100.00	15.15
2277	do.....	do.....	100.00	15.15
2314	do.....	do.....	100.00	22.55
2315				
2316				
2323				
2326	do.....	do.....	100.00	18.80
2481	do.....	do.....	100.00	
2503	do.....	Nebraska.....	150.00	20.10
2504	do.....	do.....	150.00	

¹ Interest.

Summary of suits under the twenty-eight hour law resulting in judgment for the Government during the fiscal year from July 1, 1910, to June 30, 1911—Continued.

Case No.	Railroad involved.	Judicial district.	Penalty assessed.	Costs assessed.
2697	Chicago & Northwestern.	Illinois, northern district.	\$100.00	\$18.55
2698	Chicago, Burlington & Quincy.	Nebraska.	100.00	188.63
279	do.	do.	100.00	
280	do.	do.	100.00	
493	do.	do.	100.00	81.60
579	do.	do.	100.00	162.70
580	do.	do.	100.00	
581	do.	do.	100.00	11.90
1598	do.	do.	100.00	
2056	do.	Minnesota.	500.00	19.96
2058	do.	do.	100.00	19.60
2115	do.	Illinois, eastern district.	100.00	13.61
2580	do.	Ohio, southern district.	100.00	68.25
1961	Chicago, Cincinnati & Louisville.	Nebraska.	100.00	15.00
2054	Chicago Great Western.	Minnesota.	150.00	19.25
2055	do.	do.	100.00	29.73
1983	Chicago, Milwaukee & St. Paul.	South Dakota.	100.00	12.00
1984	do.	Iowa, southern district.	100.00	24.59
1985	do.	do.	100.00	
1986	do.	South Dakota.	100.00	29.58
1987	do.	do.	100.00	12.00
1990	do.	Illinois, northern district.	100.00	14.70
2023	do.	do.	100.00	14.85
2024	do.	do.	100.00	14.85
2023	do.	do.	100.00	14.85
2026	do.	do.	100.00	14.85
2038	do.	do.	100.00	14.85
2043	do.	do.	100.00	14.85
2044	do.	do.	100.00	14.70
2045	do.	do.	100.00	14.70
2046	do.	do.	100.00	14.70
2047	do.	do.	100.00	14.85
2048	do.	do.	100.00	14.70
2066	do.	Iowa, southern district.	100.00	13.91
2070	do.	Illinois, northern district.	100.00	14.85
2071	do.	do.	100.00	14.85
2112	do.	Minnesota.	100.00	19.25
2113	do.	do.	100.00	
2208	do.	Iowa, northern district.	100.00	14.16
2269	do.	Illinois, northern district.	100.00	14.85
972	Cincinnati, New Orleans & Texas Pacific.	Ohio, southern district.	100.00	23.75
973	do.	do.	100.00	23.75
974	do.	do.	100.00	23.60
1759	Chicago, Rock Island & Pacific.	Oklahoma, western district.	100.00	8.50
1760	do.	do.	100.00	
1945	do.	do.	100.00	12.00
1946	do.	do.	100.00	12.00
2051	do.	Nebraska.	100.00	17.05
2052	do.	do.	100.00	
2444	do.	Missouri, western district.	100.00	22.04
2445	do.	do.	100.00	
2489	do.	Kansas.	100.00	18.55
2574	do.	do.	100.00	18.55
2575	do.	Nebraska.	100.00	14.70
2629	Cleveland, Cincinnati, Chicago & St. Louis.	Ohio, northern district.	100.00	19.16
2766	do.	Ohio, southern district.	200.00	20.21
2150	Delaware, Lackawanna & Western.	New Jersey.	100.00	6.00
2009	Denver & Rio Grande.	Utah.	250.00	106.06
2010	do.	do.		
1690	Eastern Railway of New Mexico.	New Mexico.	100.00	98.55
1849	Pecos & Northern Texas.	Oklahoma, western district.	100.00	
727	Southern Kansas Railway of Texas.	Texas, western district.	200.00	66.00
1690	Galveston, Harrisburg & San Antonio.	Montana.	150.00	17.50
1942	Great Northern.	do.	100.00	23.50
2124	do.	Minnesota.	100.00	19.35
2393	do.	Washington, western district.	100.00	36.59
2027	Illinois Central.	Illinois, northern district.	100.00	15.15
2028	do.	do.	100.00	15.15
2029	do.	do.	100.00	15.15
2160	do.	do.	100.00	15.15
2325	do.	do.	100.00	15.15

¹ Interest.

Summary of suits under the twenty-eight hour law resulting in judgment for the Government during the fiscal year from July 1, 1910, to June 30, 1911—Continued.

Case No.	Railroad involved.	Judicial district.	Penalty assessed.	Costs assessed.
2576	Illinois Central.....	Illinois, northern district.....	\$100.00	\$23.00
2578	do.....	do.....	100.00	19.00
2579	do.....	do.....	100.00	19.00
2581	do.....	do.....	100.00	19.00
2582	do.....	do.....	100.00	19.00
2583	do.....	do.....	100.00	19.00
2584	do.....	do.....	100.00	19.00
2585	do.....	do.....	100.00	19.00
2611	do.....	do.....	100.00	19.00
2666	do.....	do.....	100.00	19.00
2667	do.....	do.....	100.00	19.00
2668	do.....	do.....	100.00	19.00
2669	do.....	do.....	100.00	19.00
2670	Indiana Harbor Belt.....	do.....	100.00	29.20
2671	do.....	do.....	100.00	29.20
2672	do.....	do.....	100.00	29.20
2673	do.....	do.....	100.00	29.20
2674	do.....	do.....	100.00	29.20
2675	do.....	do.....	100.00	29.20
1931	Kansas City, Mexico & Orient.....	Kansas.....	100.00	19.65
1969	do.....	do.....	100.00	17.00
2264	Kansas City Southern.....	Missouri, western district.....	100.00	9.05
1789	Lake Shore & Michigan Southern.....	Ohio, northern district.....	100.00	11.00
1811	do.....	do.....	100.00	19.76
1853	do.....	do.....	100.00	19.76
2125	Lehigh Valley.....	New York, western district.....	200.00	19.86
2070	Louisville & Nashville.....	Kentucky, western district.....	100.00	16.35
1944	Michigan Central.....	Michigan, eastern district.....	100.00	7.17
2203	do.....	do.....	100.00	7.17
2201	Minneapolis & St. Louis.....	Minnesota.....	200.00	19.50
2206	do.....	do.....	200.00	19.50
2040	Minneapolis, St. Paul & Sault Ste. Marie.....	do.....	100.00	18.46
2222	do.....	Wisconsin, eastern district.....	100.00	16.96
1869	Missouri Pacific.....	Missouri, eastern district.....	100.00	20.86
1870	do.....	do.....	100.00	20.86
2621	do.....	do.....	100.00	20.00
2636	do.....	do.....	100.00	20.14
2170	New York Central & Hudson River.....	New York, western district.....	500.00	17.01
2322	do.....	Massachusetts.....	100.00	17.01
2452	do.....	do.....	300.00	17.01
2660	do.....	do.....	200.00	17.01
1303	Northern Pacific.....	Montana.....	125.00	18.70
1898	do.....	do.....	250.00	12.20
1953	do.....	do.....	150.00	12.00
1958	do.....	North Dakota.....	100.00	55.00
1960	do.....	do.....	100.00	55.00
2198	do.....	Montana.....	150.00	27.30
2199	do.....	do.....	100.00	27.30
2200	do.....	do.....	200.00	31.90
2201	do.....	Montana.....	300.00	13.10
2219	do.....	North Dakota.....	100.00	32.80
2548	do.....	do.....	100.00	32.80
2549	do.....	do.....	150.00	32.70
2550	do.....	do.....	150.00	32.70
1059	Northern Pacific Terminal.....	Oregon.....	100.00	45.62
1060	do.....	do.....	100.00	45.62
1077	do.....	do.....	100.00	45.62
1078	do.....	do.....	100.00	45.62
1086	do.....	do.....	100.00	45.62
1927	Oregon Railroad & Navigation.....	do.....	100.00	25.32
2278	do.....	Idaho.....	350.00	23.00
1926	Oregon Short Line.....	Oregon.....	100.00	90.22
1971	do.....	do.....	100.00	90.22
1972	do.....	Montana.....	250.00	22.90
2072	do.....	Idaho.....	200.00	25.80
2309	do.....	do.....	250.00	20.00
2488	do.....	Utah.....	200.00	12.40
2495	do.....	Idaho.....	250.00	20.00
2469	Pecos & Northern Texas.....	Texas, northern district.....	200.00	114.00
1907	Pere Marquette.....	Michigan, western district.....	150.00	37.71
1797	St. Louis & San Francisco.....	Oklahoma, western district.....	200.00	14.35
1910	do.....	Arkansas, western district.....	100.00	14.25
1911	do.....	do.....	100.00	14.25
2619	do.....	Tennessee, western district.....	100.00	18.92
2650	do.....	do.....	100.00	32.65
2653	do.....	do.....	100.00	32.65
2744	do.....	Missouri, eastern district.....	100.00	18.94

¹ Interest.

Summary of suits under the twenty-eight hour law resulting in judgments for the Government during the fiscal year from July 1, 1910, to June 30, 1911—Continued.

Case No.	Railroad involved.	Judicial district.	Penalty assessed.	Costs assessed.
1860	St. Louis, Iron Mountain & Southern...	Missouri, eastern district.....	\$200.00	\$440.64
1903				
1962	do.	do.	100.00	20.14
2661	St. Louis Merchants' Bridge Terminal..	Illinois, eastern district.....	100.00	15.91
2333	Texas & Pacific.....	Texas, northern district.....	100.00	
2561	Union Pacific.....	Nebraska.....	200.00	
661	do.	do.	200.00	58.00
662	do.	do.	200.00	
663	do.	do.	100.00	342.99
1279	do.	do.	100.00	
1280	do.	do.	100.00	
1281	do.	do.	100.00	
1282	do.	do.	100.00	
1283	do.	do.	100.00	
1284	do.	do.	100.00	
1552	do.	do.	250.00	50.15
2073	do.	Wyoming.....	500.00	313.70
1806	Wabash.....	Missouri, eastern district.....	200.00	28.09
1893	do.	do.	100.00	18.79
2556	do.	Nebraska.....	100.00	16.36
2623	do.	Missouri, eastern district.....	200.00	19.88
2630	do.	do.	150.00	19.38
2632	do.	do.	100.00	18.88
2634	do.	do.	100.00	18.94
2741	do.	do.	200.00	21.05
2743	do.	do.	200.00	21.05
Number of cases.....				254
Penalties recovered.....				\$26,075.00
Costs.....				\$5,765.67
Interest.....				\$18.18

Violations reported to the Department of Justice, pending or disposed of during the fiscal year ended June 30, 1911.

ACT OF MAY 29, 1884.

Case No.	Defendant.	Judicial district.	Offense charged.	Status.
36	H. J. Benson.....	Iowa, Northern district.....	Interstate shipment of sheep affected with scabies.	Nolle prosequi entered.
43	do.....	do.....	do.....	Plea of guilty entered and fine of \$100 and costs imposed.
68	W. H. Whaley, Jr.....	Kentucky, eastern district.....	do.....	Nolle prosequi entered.
138	Louis Gray.....	Missouri, eastern district.....	do.....	Dismissed.
191	W. H. Whaley, Jr.....	Kentucky, eastern district.....	do.....	Verdict of not guilty rendered.
208	Atehison, Topeka & Santa Fe Ry.....	Texas, northern district.....	Transportation of cattle affected with tuberculosis.	Dismissed.
210	S. K. Hodgkin.....	Kentucky, eastern district.....	Interstate shipment of sheep affected with scabies.	Demurrer to indictment sustained and defendant placed under recognizance.
215	J. Jenson and Allen Dudley.....	Nebraska.....	Driving interstate a cow affected with tuberculosis.	Plea of guilty entered and a fine of \$10 imposed on each defendant.
280	L. S. Stealy and Verness E. Stealy.....	Michigan, western district.....	Interstate shipment of cattle affected with tuberculosis.	Grand jury failed to indict on two presentations.
307	A. Rudler.....	North Dakota.....	do.....	Plea of guilty entered and fine of \$100 imposed.
317	C. F. Hunt.....	New York, northern district.....	do.....	Defendant arraigned, plead not guilty, and gave bail for his appearance at October, 1911, term.
319	Hector McKenzie.....	Oklahoma, western district.....	Interstate shipment of sheep affected with scabies.	Plea of guilty entered and fine of \$200 and costs imposed.
325	W. J. Cummings.....	Missouri, western district.....	Interstate movement of a cow affected with tuberculosis, in a private conveyance.	Information filed; case set for trial at November, 1911, term.
330	C. E. Wiley.....	Indiana.....	Interstate shipment of a cow affected with tuberculosis.	Defendant died pending proceedings.
331	A. E. Leavitt.....	North Dakota.....	Interstate shipment of horses affected with glanders.	Case set for trial.
345	John Erickson.....	Missouri, western district.....	Driving cattle interstate affected with tuberculosis.	Grand jury failed to indict.

ACT OF MAR. 3, 1905.

536a	Terminal Railroad Association of St. Louis.....	Illinois, eastern district.....	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
563a	do.....	Missouri, eastern district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
564a	do.....	do.....	do.....	Do.
555a	Chicago, Burlington & Quincy R. R.....	Missouri, western district.....	do.....	Verdict of not guilty rendered.

583a	St. Louis Merchants Bridge Terminal Ry.	Missouri, eastern district.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
560a	do.	do.	do.	Do.
570a	do.	do.	do.	Do.
573a	Terminal R. R. Association of St. Louis.	do.	do.	Do.
579a	Louisville & Nashville R. R.	Illinois, eastern district.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
583a	Terminal R. R. Association of St. Louis.	Missouri, eastern district.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
584a	do.	do.	do.	Do.
585a	do.	do.	do.	Do.
586a	do.	do.	do.	Do.
588a	do.	do.	do.	Do.
590a	do.	do.	do.	Do.
			Interstate transportation of cattle from area quarantined for scabies.	
591a	St. Louis Merchants Bridge Terminal Ry.	do.	do.	Do.
592a	do.	do.	do.	Do.
593a	Acheson, Topeka & Santa Fe Ry.	Missouri, western district.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
597a	do.	do.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
598a	Terminal R. R. Association of St. Louis.	Missouri, eastern district.	do.	Plea of guilty entered and fine of \$100 imposed; order entered allowing 60 days for supersedeas.
602a	Louisville & Nashville R. R.	Alabama, northern district.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
			do.	Do.
603a	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	do.	Do.
604a	do.	Missouri, eastern district.	do.	Do.
605a	do.	do.	do.	Dismissed.
			Interstate transportation of cattle from area quarantined for scabies.	
606a	Chicago, Burlington & Quincy R. R.	Illinois, eastern district.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
607a	do.	do.	do.	Do.
608a	St. Louis National Stock Yards	do.	do.	Do.
609a	do.	do.	do.	Do.
610a	St. Louis Merchants Bridge Terminal Ry.	Missouri, eastern district.	do.	Do.
611a	St. Louis National Stock Yards	Illinois, eastern district.	do.	Do.
			do.	Do.
612a	do.	do.	do.	Do.
613a	do.	do.	do.	Do.
614a	do.	do.	do.	Do.
615a	Terminal R. R. Association of St. Louis.	Missouri, eastern district.	do.	Do.
616a	do.	do.	do.	Do.
617a	El Paso & Northeastern R. R.	Texas, western district.	do.	Do.
618a	do.	do.	do.	Dismissed.
			Interstate transportation of cattle from area quarantined for scabies.	
619a	Louisville & Nashville R. R.	Tennessee, middle district.	do.	Verdict of not guilty returned.

Violations reported to the Department of Justice, pending or disposed of during the fiscal year ended June 30, 1911—Continued.

ACT OF MAR. 3, 1905—Continued.

Case No.	Defendant.	Judicial district.	Offense charged.	Status.
620a	Terminal R. R. Association of St. Louis.	Missouri, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
623a	Louisville & Nashville R. R.	Tennessee, middle district.	do.	Verdict of not guilty returned.
624a	do.	Alabama, northern district.	do.	Plea of guilty entered and fine of \$100 imposed; order entered allowing 60 days for filing supersedeas.
625a	St. Louis National Stock Yards.	Illinois, eastern district.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
627a	Terminal R. R. Association of St. Louis.	Missouri, eastern district.	do.	Do.
628a	do.	do.	do.	Do.
629a	St. Louis National Stock Yards.	Illinois, eastern district.	do.	Do.
630a	do.	do.	do.	Do.
631a	St. Louis Merchants Bridge Terminal Ry.	Missouri, eastern district.	Interstate transportation of cattle from area quarantined for scabies.	Do.
632a	Terminal R. R. Association of St. Louis.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
633a	St. Louis National Stock Yards.	Illinois, eastern district.	do.	Do.
634a	do.	do.	do.	Do.
635a	St. Louis Merchants Bridge Terminal Ry.	Missouri, eastern district.	do.	Do.
636a	do.	do.	do.	Do.
637a	Chicago, Rock Island & Pacific Ry.	Oklahoma, eastern district.	do.	Do.
638a	St. Louis Merchants Bridge Terminal Ry.	Missouri, eastern district.	Interstate transportation of cattle from area quarantined for scabies.	Plea of guilty entered and fine of \$100 and costs imposed.
639a	do.	do.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
640a	Aitchison, Topeka & Santa Fe Ry.	Oklahoma, western district.	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
641a	St. Louis Merchants Bridge Terminal Ry.	Illinois, east rn district.	do.	Suit filed and continued, awaiting return of witnesses to United States.
642a	Terminal R. R. Association of St. Louis.	do.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
45	James Marler and J. H. Ballantyne.	Idaho.	Driving sheep interstate from area quarantined for scabies.	Plea of guilty entered and fine of \$100 imposed on each defendant.
46	John Zane and Elmer Edwards.	Oklahoma, eastern district.	Driving a cow interstate from area quarantined for splenic fever.	Zane indicted and several warrants for his arrest returned not found.
67	St. Louis & San Francisco R. R. and L. R. Jinkins.	Oklahoma, western district.	Interstate transportation and delivery for shipment of cattle from area quarantined for splenic fever.	Grand jury failed to indict.

70	Seaboard Air Line Ry. and Miller Union Stock Yards.	Georgia, northern district.	do.	Nolle prosequi entered upon payment of penalty of \$100 and costs, as to Seaboard Air Line; verdict of not guilty, as to Miller Union Stock Yard.
75	Terminal R. R. Association of St. Louis.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for scabies.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
76	St. Louis Merchants Bridge Terminal Ry.	do.	do.	Do.
77	M. V. Robertson.	Texas, northern district.	Driving sheep interstate from area quarantined for scabies.	Plea of guilty entered and fine of \$25 imposed.
85	Gulf, Colorado & Santa Fe Ry.	Texas, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Plea of guilty entered and fine of \$100 and costs imposed.
86	do.	Missouri, eastern district.	do.	Do.
87	St. Louis Merchants Bridge Terminal Ry.	do.	Interstate transportation of cattle from area quarantined for scabies.	Judgment of district court against defendant reversed.
88	do.	do.	Interstate transportation of sheep from area quarantined for scabies.	Do.
89	do.	do.	do.	Do.
93	do.	do.	Interstate transportation of cattle from area quarantined for scabies.	Do.
94	do.	do.	do.	Do.
95	do.	do.	Interstate transportation of cattle from area quarantined for scabies.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
96	Terminal R. R. Association of St. Louis.	Illinois, eastern district.	do.	Do.
97	do.	do.	do.	Suit filed and pending, awaiting decision of Supreme Court in cases 281, 282, and 288.
100	do.	do.	Interstate transportation of sheep from area quarantined for scabies.	Do.
101	do.	do.	do.	Do.
102	St. Louis Merchants Bridge Terminal Ry.	North Carolina, western district.	Interstate shipment of cattle from area quarantined for splenic fever.	Plea of guilty entered and judgment suspended on payment of costs.
104	R. C. McManus.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for scabies.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
105	St. Louis Merchants Bridge Terminal Ry.	do.	Interstate transportation of sheep from area quarantined for scabies.	Do.
106	do.	do.	Interstate transportation of cattle from area quarantined for scabies.	Do.
107	do.	do.	do.	Do.
108	Terminal R. R. Association of St. Louis.	do.	do.	Do.
109	do.	do.	do.	Do.
110	St. Louis Merchants Bridge Terminal Ry.	do.	do.	Do.
115	Terminal R. R. Association of St. Louis.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
116	do.	do.	Interstate transportation of sheep from area quarantined for scabies.	Do.
118	do.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
119	do.	do.	do.	Do.

Violations reported to the Department of Justice, pending or disposed of during the fiscal year ended June 30, 1911—Continued.

ACT OF MAR. 3, 1905—Continued.

Case No.	Defendant.	Judicial district.	Offense charged.	Status.
120	Terminal R. R. Association of St. Louis.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
121	do.	do.	do.	Do.
122	do.	do.	do.	Do.
123	St. Louis National Stock Yards.	do.	Interstate transportation of sheep from area quarantined for scabies.	Do.
124	do.	do.	do.	Do.
125	do.	do.	do.	Do.
126	do.	do.	do.	Do.
127	do.	do.	do.	Do.
128	do.	do.	do.	Do.
129	do.	do.	do.	Do.
130	do.	do.	do.	Do.
131	do.	do.	do.	Do.
132	St. Louis Merchants Bridge Terminal Ry.	do.	Interstate transportation of cattle from area quarantined for scabies.	Do.
133	Terminal R. R. Association of St. Louis.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
135	Atchison, Topeka & Santa Fe Ry.	Missouri, western district.	do.	Do.
136	St. Louis National Stock Yards.	Illinois, eastern district.	Interstate transportation of sheep from area quarantined for scabies.	Plea of guilty entered and fine of \$100 and costs imposed.
137	do.	do.	do.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
151	St. Louis Merchants Bridge Terminal Ry.	do.	Interstate transportation of cattle from area quarantined for scabies.	Do.
152	do.	do.	do.	Do.
153	do.	do.	do.	Do.
154	do.	do.	do.	Do.
155	do.	do.	do.	Do.
156	do.	do.	do.	Do.
157	A. W. Whitaker.	North Carolina, western district.	Interstate transportation of cattle from area quarantined for splenic fever.	Plea of guilty entered and judgment suspended on payment of costs.
165	St. Louis National Stock Yards.	Illinois, eastern district.	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
166	do.	do.	do.	Do.
168	do.	do.	do.	Do.
169	St. Louis & Southwestern Ry.	Arkansas, western district.	Interstate transportation of cattle from area quarantined for splenic fever.	Grand jury failed to indict.
174	P. M. Brown, J. D. Patterson, and A. H. Pack.	Georgia, northern district.	Driving cattle interstate from area quarantined for splenic fever.	Plea of guilty entered and a fine of \$10 imposed on each defendant.
176	St. Louis National Stock Yards.	Illinois, eastern district.	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.

177	St. Louis	do.	do.	do.	do.	Do.
179	St. Louis Merchants Bridge Terminal Ry.	do.	do.	do.	Interstate transportation of cattle from area quarantined for scabies.	Do.
180	Terminal R. R. Association of St. Louis.	do.	do.	do.	Interstate transportation of cattle from area quarantined for splenetic fever.	Do.
181	Chicago.	do.	do.	do.	do.	do.
182	Chicago, Rock Island & Pacific Ry.; Nashville, Chattanooga & St. Louis Ry.	Tennessee, western district.	do.	do.	Interstate transportation of horses from area quarantined for splenetic fever.	Plea of guilty entered and a fine of \$100 and costs imposed on each defendant.
187	St. Louis National Stock Yards.	Illinois, eastern district.	do.	do.	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
188	Mobile & Ohio R. R.	Alabama, middle district.	do.	do.	Interstate transportation of cattle from area quarantined for splenetic fever.	Plea of guilty entered and fine of \$100 and costs imposed.
189	Seaboard Air Line Ry.	South Carolina.	do.	do.	do.	Plea of guilty entered by receivers, and fine of \$100 and costs imposed.
192	Nashville, Chattanooga & St. Louis Ry.	Alabama, northern district.	do.	do.	do.	Damurrer filed by defendant; pending.
192a	Southern Ry.	South Carolina.	do.	do.	do.	Damurrer interposed by defendant overruled and case set for trial October, 1911.
194	St. Louis National Stock Yards.	Illinois, eastern district.	do.	do.	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
195	do.	do.	do.	do.	do.	Do.
197	Southern Ry.	Georgia, northern district.	do.	do.	Interstate transportation of cattle from area quarantined for splenetic fever.	Indictment returned; pending.
199	Atchison, Topeka & Santa Fe Ry.	Oklahoma, western district.	do.	do.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
200	Kansas City, Mexico & Orient Ry.	Kansas.	do.	do.	do.	Do.
201	do.	do.	do.	do.	do.	Do.
202	do.	do.	do.	do.	do.	Do.
203	P. Markey, B. E. Hughes, and Missouri Pacific Ry.	do.	do.	do.	Interstate transportation and delivery for shipment of cattle from area quarantined for scabies.	Pleas of guilty entered and a fine of \$100 and costs imposed on each defendant.
205	Louisville & Nashville R. R.	Alabama, southern district.	do.	do.	Interstate transportation of cattle from area quarantined for splenetic fever.	Set for trial November, 1911, term.
206	do.	do.	do.	do.	do.	Do.
207	O. E. Peters, W. E. Waisner, and G. W. Waisner.	Montana.	do.	do.	Driving sheep interstate from area quarantined for lip-and-leg ulceration.	Pleas of guilty entered and fine of \$100 imposed on each defendant.
211	St. Louis National Stock Yards.	Illinois, eastern district.	do.	do.	Interstate transportation of cattle from area quarantined for splenetic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
212	Western & Atlantic R. R.	Georgia, northern district.	do.	do.	do.	Indictment returned; pending.
213	D. L. Green.	North Carolina, western district.	do.	do.	Driving cattle interstate from area quarantined for splenetic fever.	Indictment returned and capias ordered.
214	George W. Caldwell.	Arkansas, eastern district.	do.	do.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
216	T. B. McKee, Grover McKee, Clinton Van Hueser, and Gus Phillips.	Alabama, northern district.	do.	do.	do.	Nolle prosequi entered as to Grover McKee and Clinton Van Hueser; pleas of guilty entered by T. B. McKee and Gus Phillips and fine of \$100 imposed on each. Indictment returned.
217	St. Louis & San Francisco R. R.	Oklahoma, eastern district.	do.	do.	Interstate transportation of cattle from area quarantined for splenetic fever.	Plea of guilty entered and fine of \$100 imposed.
218	Southern Ry.	South Carolina.	do.	do.	do.	Do.

Violations reported to the Department of Justice, pending or disposed of during the fiscal year ended June 30, 1911—(Continued.)

ACT OF MAR. 3, 1905—Continued.

Case No.	Defendant.	Judicial district.	Offense charged.	Status.
219	Richmond, Fredericksburg & Potomac R. R.	Virginia.....	Interstate transportation of cattle from area quarantined for splenic fever.	Demurrer interposed by defendant sustained.
220	do.....	do.....	do.....	Do.
221	St. Louis National Stock Yards.....	Illinois, eastern district.....	do.....	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
222	do.....	do.....	do.....	Do.
223	Chicago, Rock Island & Pacific Ry.....	Oklahoma, eastern district.....	Interstate transportation of sheep from area quarantined for scabies.	Grand jury failed to indict because of failure of witnesses to appear.
224	Southern Ry.....	South Carolina.....	Interstate transportation of cattle from area quarantined for splenic fever.	Plea of guilty entered and fine of \$100 imposed.
225	St. Louis National Stock Yards.....	Illinois, eastern district.....	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
226	do.....	do.....	do.....	Do.
227	do.....	do.....	do.....	Do.
228	Southern Ry.....	South Carolina.....	Interstate transportation of cattle from area quarantined for splenic fever.	Plea of guilty entered and fine of \$100 imposed.
229	do.....	do.....	do.....	Do.
230	do.....	do.....	do.....	Do.
231	do.....	do.....	do.....	Do.
232	do.....	do.....	do.....	Do.
233	Terminal R. R. Association of St. Louis	Missouri, eastern district.....	Interstate transportation of sheep from area quarantined for scabies.	Demurrer filed by defendant; pending.
234	St. Louis National Stock Yards.....	Illinois, eastern district.....	do.....	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
235	do.....	do.....	do.....	Do.
236	do.....	do.....	do.....	Do.
237	do.....	do.....	do.....	Do.
238	do.....	do.....	do.....	Do.
239	do.....	do.....	do.....	Do.
240	do.....	do.....	do.....	Do.
241	do.....	do.....	do.....	Do.
242	do.....	do.....	do.....	Do.
243	do.....	do.....	do.....	Do.
244	St. Louis Merchants Bridge Terminal Ry.	Missouri, eastern district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Demurrer filed by defendant; pending.
245	Kansas City Southern Ry.....	Arkansas, western district.....	do.....	Information filed and case set for trial.
246	do.....	do.....	do.....	Do.
247	St. Louis National Stock Yards.....	Illinois, eastern district.....	do.....	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
248	do.....	do.....	Interstate transportation of sheep from area quarantined for scabies.	Do.
249	do.....	do.....	do.....	Do.

250	do.	do.	do.	do.	do.	Plea of guilty entered and fine of \$200 and costs imposed.
251	Chicago, Rock Island & Pacific Ry.	Oklahoma, western district.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	do.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
252	St. Louis National Stock Yards.	Illinois, eastern district.	do.	Interstate transportation of sheep from area quarantined for seabies.	do.	do.
253	do.	do.	do.	do.	do.	Grand jury failed to indict.
254	do.	Tennessee, eastern district.	do.	Allowing cattle to stray from area quarantined for splenic fever to another State.	do.	do.
255	J. H. Pulliam.	do.	do.	do.	do.	do.
256	John Stewart.	do.	do.	do.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
257	F. H. James.	Missouri, western district.	do.	do.	do.	Case set for trial at November, 1911, term.
258	W. H. Cary.	do.	do.	do.	do.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
259	R. E. Lambert.	Alabama, southern district.	do.	Interstate shipment of a bull from area quarantined for splenic fever.	do.	Indictment returned; case set for trial at November, 1911, term.
260	St. Louis National Stock Yards.	Illinois, eastern district.	do.	Interstate transportation of cattle from area quarantined for seabies.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
261	Atchison, Topeka & Santa Fe Ry.	Missouri, western district.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	do.	do.
262	Texarkana & Fort Smith R. R.	Texas, eastern district.	do.	do.	do.	do.
263	Virtue O. Hopkins.	South Carolina.	do.	Driving of cattle interstate from area quarantined for splenic fever.	do.	do.
264	Missouri, Kansas & Texas Ry.	Oklahoma, eastern district.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	do.	Grand jury failed to indict.
265	R. P. Hamer.	South Carolina.	do.	Driving a cow interstate from area quarantined for splenic fever.	do.	Fine of \$100 imposed and suspended to allow defendant to apply for remission.
266	William Van Meter.	Missouri, western district.	do.	Driving cattle interstate from area quarantined for splenic fever.	do.	Plea of guilty entered and fine of \$100 and costs imposed.
267	J. Frank Little.	South Carolina.	do.	Driving a cow interstate from area quarantined for splenic fever.	do.	Grand jury failed to indict.
268	Atchison, Topeka & Santa Fe Ry.	Oklahoma, eastern district.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	do.	do.
269	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	do.	do.	do.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
270	do.	do.	do.	do.	do.	do.
271	do.	do.	do.	do.	do.	do.
272	Lionel Mayfield.	Missouri, western district.	do.	Driving interstate a cow from area quarantined for splenic fever.	do.	Grand jury failed to indict.
273	Simon Franklin, Henry Taylor, Sandy Spates, and Edgar Foy.	Alabama, northern district.	do.	Driving cattle interstate from area quarantined for splenic fever.	do.	Plea of guilty entered by Edgar Foy and fine of \$100 and costs imposed; \$25 paid, balance suspended. Nolle prosequi entered as to other defendants.
274	Simon Franklin and Frank Willingham.	do.	do.	do.	do.	Plea of guilty entered by each defendant, and fine of \$100 and costs imposed on each; \$25 paid by each, balance suspended.
275	Henry Taylor, Sandy Spates, and Edgar Foy.	do.	do.	do.	do.	Plea of guilty entered by Taylor and Spates and fine of \$100 and costs imposed on each; \$25 paid by each, balance suspended.
276	Terminal R. R. Association of St. Louis.	Illinois, eastern district.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	do.	Nolle prosequi entered as to Foy.
277						Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.

Violations reported to the Department of Justice, pending or disposed of during the fiscal year ended June 30, 1911—Continued.

ACT OF MAR. 3, 1905—Continued.

Case No.	Defendant.	Judicial district.	Offense charged.	Status.
278	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288. Plea of guilty entered and fine of \$125 imposed. Indictment quashed on grounds that no prosecution lies against a connecting carrier outside of the quarantined area. Appeal to United States Supreme Court, and set for hearing October, 1911, term.
279	T. G. McCraw.	South Carolina.	Driving cattle interstate from area quarantined for splenic fever.	
281	Baltimore & Ohio Southwestern R. R.	Ohio, southern district.	Interstate transportation of sheep from area quarantined for scabies.	
282	do.	do.	do.	
283	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288. Plea of guilty entered and judgment suspended on payment of costs. Indictment quashed on grounds that no prosecution lies against a connecting carrier outside of the quarantined area. Appeal to United States Supreme Court, and set for hearing October, 1911, term.
284	Dave Bryant.	North Carolina, western district.	Interstate movement of a calf in a private conveyance from area quarantined for splenic fever.	
288	Baltimore & Ohio Southwestern R. R.	Ohio, southern district.	Interstate transportation of sheep from area quarantined for scabies.	
289	St. Louis National Stock Yards.	Illinois, eastern district.	do.	
290	do.	do.	do.	Indictment quashed on grounds that no prosecution lies against a connecting carrier outside of the quarantined area. Appeal to United States Supreme Court, and set for hearing October, 1911, term. Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288. do. do. Verdict of not guilty.
291	do.	do.	do.	
292	W. I. Umpley.	Tennessee, eastern district.	Driving a cow interstate from area quarantined for splenic fever.	
295	St. Louis National Stock Yards.	Illinois, eastern district.	Interstate transportation of sheep from area quarantined for scabies.	
296	do.	do.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288. do. do. Verdict of not guilty.
297	Lake Shore & Michigan Southern Ry.	Indiana.	do.	
298	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	do.	
299	Elizabeth Hill and Lee Snipes.	North Carolina, western district.	Interstate movement of a calf in a private conveyance from area quarantined for splenic fever.	
300	Kansas City, Mexico & Orient Ry.	Texas, Northern district.	Interstate transportation of sheep from area quarantined for scabies.	Plea of guilty entered and fine of \$100 and costs imposed. Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288. Indictment returned and capias ordered. do. do. Aggregate fine of \$200 and costs imposed.
301	do.	do.	do.	
302	do.	do.	do.	
303	do.	do.	do.	

305	Joseph Speers.....	Arkansas, western district.....	Driving cattle interstate from area quarantined for splenic fever.	Indictment returned, defendant arrested, and case set for trial.
308	Lee Huffaker.....	Missouri, western district.....	do.....	Plea of guilty entered and fine of \$100 and costs imposed.
309	Peter Gravelle.....	Oklahoma, western district.....	do.....	Plea of guilty entered and fine of \$125 imposed.
310	Illinois Central R. R.....	Mississippi, southern district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Indictment returned and case set for trial at November, 1911, term.
311	Atchison, Topeka & Santa Fe Ry. and St. Joseph Belt Ry.	Missouri, western district.....	do.....	Indictment returned against both defendants; case set for trial at September, 1911, term.
312	John H. Verner.....	North Carolina, western district.....	Interstate movement of cattle on foot and in a private conveyance from area quarantined for splenic fever.	Plea of guilty entered and judgment suspended on payment of costs.
313	Paul Donnelly.....	Oklahoma, eastern district.....	Interstate shipment of cattle from area quarantined for splenic fever.	Grand jury failed to indict.
314	Illinois Central R. R.....	Mississippi, southern district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Indictment returned and case set for trial at November, 1911, term.
315	Louisville & Nashville R. R.....	Georgia, northern district.....	do.....	Plea of guilty entered and fine of \$100 and costs imposed.
316	G. B. Walker.....	Kansas.....	Interstate shipment of cattle from area quarantined for scabies.	Suit filed and pending.
318	P. J. Garrard.....	Arkansas, eastern district.....	Interstate shipment of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
320	St. Louis National Stock Yards.....	Illinois, eastern district.....	Interstate transportation of sheep from area quarantined for scabies.	Do.
321	do.....	do.....	Interstate transportation of cattle from area quarantined for splenic fever.	Case to be presented to the grand jury October, 1911.
322	J. A. Shanklin.....	South Carolina.....	do.....	Plea of guilty entered and fine of \$100 and costs imposed.
323	S. F. Rigby.....	Utah.....	Driving sheep interstate from area quarantined for scabies.	Case to be presented to next grand jury.
326	B. R. Grimes.....	Oklahoma, western district.....	Driving cattle interstate from area quarantined for scabies in cattle.	Do.
327	do.....	do.....	do.....	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
328	St. Louis National Stock Yards.....	Illinois, eastern district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Do.
329	do.....	do.....	do.....	Do.
332	do.....	do.....	do.....	Do.
333	Kansas City, Mexico & Orient Ry.	Texas, northern district.....	Interstate movement of cattle on foot and by rail from area quarantined for splenic fever.	Grand jury failed to indict.
334	Hugo Milde.....	Oklahoma, western district.....	do.....	Indictment returned and case set for trial September, 1911.
335	William Blake.....	Missouri, eastern district.....	do.....	Information filed and defendant ordered to give bail for appearance.
336	St. Louis & San Francisco R. R.	Oklahoma, eastern district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Grand jury failed to indict.
338	Lee Yeoman.....	Oklahoma, western district.....	Driving cattle interstate from area quarantined for splenic fever.	Do.
339	Whitwell Beatson.....	North Carolina, western district.....	Interstate transportation of cattle from area quarantined for splenic fever.	Case to be presented to next grand jury.
341	St. Louis National Stock Yards.....	Illinois, eastern district.....	do.....	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.

Violations reported to the Department of Justice, pending or disposed of during the fiscal year ended June 30, 1911—Continued.

ACT OF MAR. 3, 1905—Continued.

Case No.	Defendant.	Judicial district.	Offense charged.	Status.
342	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
343	John M. Merritt.	do.	do.	Do.
344	John M. Merritt.	Texas, southern district.	Interstate shipment of mules from area quarantined for splenic fever.	Case to be presented to grand jury at October, 1911, term.
346	Kansas City, Mexico & Orient Ry.	Oklahoma, western district.	Interstate transportation of sheep from area quarantined for scabies.	Grand jury failed to indict.
347	Illinois Central R. R.	Mississippi, southern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Indictment returned and case set for trial November, 1911, term.
348	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	Allowing cattle to stray from area quarantined for splenic fever to another State.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
349	W. M. Marsh.	Missouri, western district.	Interstate transportation of cattle from area quarantined for splenic fever.	Grand jury failed to indict.
350	St. Louis Merchants Bridge Terminal Ry.	Illinois, eastern district.	Interstate transportation of cattle from area quarantined for splenic fever.	Suit filed and pending awaiting decision of Supreme Court in cases 281, 282, and 288.
351	do.	do.	do.	Do.
353	Louisville & Nashville R. R.	Ohio, southern district.	Interstate transportation of sheep from area quarantined for scabies.	To be presented to grand jury at October, 1911, term.
354	do.	do.	do.	Do.
355	Chesapeake & Ohio Ry.	Kentucky, eastern district.	do.	To be presented to next grand jury.
356	do.	do.	do.	Do.
357	Chicago, Rock Island & Pacific Ry.	Arkansas, eastern district.	Interstate transportation of a cow from area quarantined for splenic fever.	To be presented to grand jury at October, 1911, term.
358	Atchison, Topeka & Santa Fe Ry.	Texas, northern district.	Interstate transportation of mules from area quarantined for splenic fever.	Case to be presented to next grand jury.
359	Ernest Batson.	Florida, southern district.	Interstate shipment of a calf from area quarantined for splenic fever.	Counsel for defendant asks for conference with United States attorney to adjust case.
360	J. E. Dunnaway.	Alabama, southern district.	Interstate shipment of calves from area quarantined for splenic fever.	Information filed; pending.
361	Mobile & Ohio R. R.	Illinois, eastern district.	Interstate transportation of sheep from area quarantined for scabies.	Suit filed and pending.

Cases under meat-inspection amendment of June 30, 1906, reported for prosecution during the fiscal year 1911 and disposed of in that period.

M. I. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition of case.
124	Schwarzchild & Sulzberger Co.	New York, southern district.	Unlawful use of meat-inspection labels.	Case abated by United States attorney.
126	C. H. Hanson.	Maine.	Shipment of immature veal from Maine to Massachusetts.	Pleaded guilty; fined \$100.
127	L. J. Patten.	do.	do.	Pleaded guilty; fined \$150.
128	M. Sweeney.	Minnesota.	Shipment of immature veal from Minnesota to Illinois.	Pleaded guilty; fined \$10.
131	Flehmütz & Benz.	Wisconsin, eastern district.	Shipment of immature veal from Wisconsin to Illinois.	Pleaded guilty; fined \$25.
132	H. S. Frechault.	Vermont.	Shipment of immature veal from Vermont to Massachusetts.	Pleaded guilty; sentence suspended.
133	Robert Kuelene.	Wisconsin, eastern district.	Shipment of immature veal from Wisconsin to Illinois.	Pleaded guilty; fined \$25.
134	E. Risetto.	New York, southern district.	Offering for shipment from New York to New Jersey uninspected pork.	Indicted; fined \$250.
135	J. E. Jones.	Wisconsin, eastern district.	Shipment of immature veal from Wisconsin to Illinois.	Pleaded guilty; fined \$25.
136	Roscoe J. Moores.	Maine.	Shipment of immature veal from Maine to Massachusetts.	Pleaded nolo contendere; fined \$100.
137	E. Alberti.	Pennsylvania, western district.	Shipment of uninspected meat from Pennsylvania to Ohio.	Pleaded nolo contendere; fined \$25.
138	Fred Stark.	New York, southern district.	Offering for shipment from New York to New Jersey uninspected meat.	Pleaded guilty; fined \$200 and sentenced to 10 days' imprisonment.
139	M. G. McGee.	Illinois, northern district.	Shipment of uninspected meats from Illinois to Michigan; also containing prohibited preservatives.	Jury trial; verdict of guilty; fined \$1,000.
140	William O. L. Knauck.	New Jersey.	Shipment of uninspected meat from New Jersey to New York.	Pleaded guilty; fined \$25.
141	Adolf Pols.	do.	Transportation of uninspected meat from New York to New Jersey.	Pleaded guilty; fined \$30.
142	Sears & Highfield.	Michigan, eastern district.	Shipment of uninspected veal from Michigan to New York.	Pleaded guilty; fined \$15 each.
145	Oral P. Taylor.	Wisconsin, eastern district.	Shipment of immature veal from Wisconsin to Illinois.	Pleaded guilty; fined \$10.
146	Fred Woerner.	Pennsylvania, eastern district.	Shipment of uninspected meat from Pennsylvania to New Jersey and the unlawful use of meat-inspection labels.	Pleaded guilty; fined \$20.
148	W. A. Schulz.	New York, southern district.	Shipment of immature veal from New York through New Jersey to New York City.	Convicted and fined \$100.
149	Dan Sawyer.	Michigan, western district.	Shipment of immature veal from Michigan to Illinois.	Pleaded guilty; fined \$25.
153	Julius O. Cobb and Frank W. Hill.	Maine.	Shipment of diseased beef from Maine to Massachusetts.	Fined \$100 each.
154	Wagner Bros.	Pennsylvania, eastern district.	Shipment of uninspected hard compound from Pennsylvania to Delaware.	Pleaded non vult contendere; fined \$10.
155	J. M. Lee.	New York, western district.	Shipment of immature veal from New York through New Jersey to New York City.	Pleaded guilty; fined \$5.
156	George Nye Co.	Massachusetts.	Shipment of uninspected lard from Massachusetts to Connecticut and the unlawful use of meat-inspection label.	Case dismissed by United States attorney.
159	Ed Van de Brink.	Michigan, western district.	Shipment of immature veal from Michigan to Illinois.	Pleaded guilty; fined \$25.
161	A. W. Joy.	Maine.	Unlawful use of meat-inspection labels.	Grand jury refused to return indictment.
165	Max Wertheimer.	New Jersey.	Shipment of uninspected meat from New Jersey to Pennsylvania.	Do.
169	C. Minischmidt.	Wisconsin, eastern district.	Shipment of immature veal from Wisconsin to Illinois.	Pleaded guilty; fined \$25.
179	Charles Blumke.	do.	do.	Pleaded guilty; fined \$10.
181	Host Bros.	do.	do.	Do.

Cases under meat-inspection amendment of June 30, 1906, reported for prosecution during the fiscal year 1911 and disposed of in that period—Continued.

M. I. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition of case.
183	Harry Plummer.....	Maine.....	Shipment of immature veal from Maine to Massachusetts.....	Fined \$100.
186	August Gotter.....	Wisconsin, eastern district.....	Shipment of immature veal from Wisconsin to Illinois.....	Pleaded guilty; fined \$15.
187	Turek Bros.....	do.....	do.....	Pleaded guilty; fined \$50.
188	A. Hoffman.....	New Jersey.....	Offering uninspected oleomargarine for transportation from New Jersey to New York.....	Pleaded guilty; fined \$25.
224	Frederick Wilson.....	do.....	do.....	Convicted; fined \$100.

Total fines assessed, \$3,240.

Cases referred to in previous reports but which were not mentioned therein as being closed.

M. I. case No.	Defendant.	Judicial district.	Nature of offense charged.	Disposition of case.
16	E. Forshee.....	New York, southern district.....	Shipment of 5 immature calves from New York through New Jersey to New York City.....	Dismissed.
19	P. Marchitto.....	do.....	Transportation of uninspected beef from New York to New Jersey.....	Do.
20	S. Block.....	do.....	do.....	Do.
22	Samuel Nagel.....	do.....	Transportation of uninspected calves' livers from New York to New Jersey.....	Do.
23	E. S. Alpaugh & Co.....	do.....	Transportation of uninspected veal from New York to New Jersey.....	Do.
41	Thomas Bingham & Co.....	do.....	Transportation of immature calves from New Jersey to New York.....	Do.
48	Mose Bailey.....	Louisiana, western district.....	Transportation of uninspected beef from Mississippi to Louisiana.....	Grand jury refused to return indictment.
60	W. D. McArthur and Anson Williams.....	New York, southern district.....	Shipments of uninspected meat from New York to Massachusetts.....	McArthur pleaded guilty; fined \$50.
73	G. E. Swanson.....	Pennsylvania, western district.....	Shipment of unsound meat from Pennsylvania to New York.....	Grand jury refused to indict.
83	H. C. Derby Co.....	New Jersey.....	Transportation of uninspected meat from New Jersey to New York.....	Case dismissed.
95	Pittsburg Provision & Packing Co.....	Maryland.....	Transportation of unsound meat from Maryland to West Virginia.....	Verdict for defendant.
105	Polinsky & Co.....	Minnesota.....	Unlawful use of meat inspection labels.....	Jacob Kohn, of the firm, pleaded guilty; fined \$25; nolle prosequi entered as to A. Polinsky.
108	Robert Crawford.....	West Virginia, northern district.....	Transportation of uninspected oleomargarine from West Virginia to Ohio.....	Pleaded guilty; fined \$25.

111	Hammond Co.....	Pennsylvania, eastern district.....	Transportation of uninspected meat from Pennsylvania to New Jersey.....	Pleaded non vult contendere: fined \$100.
113	Blust & Chiquennot.....	Wisconsin, eastern district.....	Transportation of immature veal from Wisconsin to Illinois.....	Pleaded guilty; fined \$50.
115	Bert Hermance.....	do.....	do.....	Pleaded guilty; fined \$25.
116	John H. Wilcox.....	New York, southern district.....	Transportation of immature veal from New York to New Jersey.....	Do.
117	John Madden.....	Wisconsin, western district.....	Shipment of immature veal from Wisconsin to Illinois.....	Pleaded nolo contendere: sentence suspended.
118	W. T. Green.....	North Carolina, western district.....	Shipment of immature veal from North Carolina to Virginia.....	Pleaded guilty; fined \$50.
119	J. G. Jones.....	Wisconsin, eastern district.....	Shipment of immature veal from Wisconsin to Illinois.....	Pleaded guilty; fined \$25.
120	Elliott Hull.....	do.....	do.....	Do.
121	F. J. Newbauer.....	Michigan, eastern district.....	Shipment of uninspected veal from Michigan to New York.....	Pleaded nolo contendere: fined \$15.
122	Theodore F. Arthur.....	Wisconsin, western district.....	Shipment of immature veal from Wisconsin to Illinois.....	Pleaded guilty; fined \$25.
123	W. H. Blake.....			

Timber-trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911.

CRIMINAL—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Status June 30, 1911.
Herrington, H. C.....	Alamo.....	New Mexico.....	Convicted; sentenced to 30 days in jail. Verdict, not guilty. Convicted and released on recognizance pending application for pardon. Convicted; fined \$7. Pleaded guilty; Reddick sentenced to 60 days and Owens to 30 days in jail. Barred by limitation after report to Attorney General and before consideration by grand jury. Nolle prosequi entered after payment of value of timber. Under bond awaiting action of grand jury. Discharged after preliminary hearing.
Johnson, T. A.....	Arkansas.....	Arkansas, western district.....	
Johnson, T. H.....	do.....	do.....	
Post, R. G.....	Alamo.....	New Mexico.....	
Reddick, W., and Owens, W.....	Florida.....	Florida, northern district.....	
Herron, S. B. and J. E.....	Coeur d'Alene.....	Idaho.....	
Iron Mountain Tunnel Co.....	Lolo.....	Montana.....	
Neal, J. H.....	Leadville.....	Colorado.....	
Walker, R. T., and Kelly, L. N.....	Harney.....	South Dakota.....	

Timber-trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911—Continued.

CIVIL—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Estimated quantity and value.	Status June 30, 1911.
Bonners Ferry Lumber Co.	Pend Oreille.	Idaho.	1,025,950 feet b. m.; value \$2,523.36.	Deposit of check for \$2,053.90 awaiting approval or rejection by Attorney General.
Gorus, G. D.	Bitterroot.	Montana.	55,970 feet b. m.; value \$922.60.	Complaint filed; pending.
Herron, S. B. and J. E.	Coeur d'Alene.	Idaho.	10,610 pieces cedar lagging, 588 ricks of wood; value \$1,147.25.	Do.
Hope Lumber Co.	Pend Oreille.	do.	120,800 feet b. m.; value \$1,208.	Do.
Iron Mountain Tunnel Co.	Lolo.	Montana.	125 cords, 174,464 feet b. m., and 200 lagging poles; value \$707.85.	Judgment for \$707.85.
King & Campbell.	Madison.	do.	1,050 poles, 169 posts, 215 braces, 53 saplings; value \$228.37.	Judgment for \$228.37.
Russell, W. B.	Cabinet.	do.	619,852 feet b. m.; value \$2,528.90.	Judgment for \$619.85.
Alanogordo Lumber Co.	Alamo.	New Mexico.	5,125,210 feet b. m. and 143,042 linear feet poles; value \$6,077.	Pending.
McIntosh, W. P.	Arkansas.	Arkansas, western district.	1,000,000 feet b. m.; value \$2,500.	Judgment for \$2,500, interest, and costs.
Miller, M. C.	do.	do.	414,240 feet b. m.; value \$238.48.	Judgment for \$417, interest, and costs.
Pomero, M.	Preos.	New Mexico.	100,000 feet b. m.; value \$100.	Pending.
Watson, A. C.	Alamo.	do.	No estimate.	Judgment for \$300 and costs.
Cannon, T.	Chelan.	Washington, eastern district.	110,160 feet b. m.; value \$1,169.	Do.
Balcomb, Prewitt and Estel.	Okanogan.	do.	223,169 feet b. m.; value \$253.10.	Pending.
Rice, J. F.	Uncompahgre.	Colorado.	No estimate.	Compromised on payment of \$7,500.
Safe Investment Gold Mining Co.	Black Hills.	South Dakota.	\$15,000 feet b. m.; value \$2,514.	Compromised on payment of \$1,500.
Carlson Timber Co.	Medicine Bow.	Wyoming.	14,530,000 feet b. m.; value \$35,572.24.	Pending settlement on offer of company to pay value of timber and construct fire line at cost of \$20,000.
Fleming Bros.	Arapaho.	Colorado.	782,000 feet b. m.; value \$1,938.37.	Compromised on payment of \$300 and agreement to clear away brush.
Teller, J. C., and Union Pacific R. R. Co.	Medicine Bow.	do.	800,000 ties; value \$28,000.	Settled by payment of value of ties (\$27,440).
Walker, R. T.	Harney.	South Dakota.	300,000 feet b. m. and 3,000 ties.	Action to replevy; pending.
Brookings Lumber & Box Co.	Angeles.	California, southern district.	183,075 feet b. m.; value \$600.86.	Settled in full before suit filed.
McLville, H. P.	Monterey.	do.	9,000 feet b. m. and 30 cords; value \$52.	Pending.
Metcalf, Wm.	Plumas.	California, northern district.	3,400,703 feet b. m.; value \$1,700.35.	Compromised on payment of \$500.
Monumental Mines Co.	Klamath.	do.	269,738 feet b. m. and 1,000 cords; value \$847.73.	Pending.
Powell, H. T.	Yale.	do.	479,000 feet b. m.; value \$760.40.	Do.
Standard Lumber Co.	Stanislaus.	do.	218,160 feet b. m.; value \$2,081.06.	Do.
Trinity Bonanza King Mining Co.	Shasta.	do.	55,500 feet b. m.; value \$652.90.	Claim filed against bankrupt estate of defendant.

CIVIL—ADMINISTRATIVE SETTLEMENT.

Trespasser.	National Forest.	Estimated quantity and value.	Status June 30, 1911.
Carbon Timber Co.	Hayden.	29,184,000 feet b. m.; value \$20,278.	Settled by payment of value of timber in full and agreement to construct fire line.
Coe, F. E.	Medicine Bow.	2,700,000 feet b. m.; value \$6,750.	Pending further investigation.
Boston & Idaho Gold Dredging Co.	Payette.	28,000 feet b. m.; value \$84.	Settled by payment in full.
Martin, S. O.	Suslaw.	1,075 pounds chittum bark; value \$26.87.	Do.

CIVIL, INJUNCTION—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Status June 30, 1911.
Milwaukee Lumber Co.	Coeur d'Alene.	Idaho.	Decree allowing defendant to file \$20,000 bond to abide determination of Interior Department on Northern Pacific grant.
Parker, Peet.	Pend Oreille.	do.	Bill filed; cutting abated.
Sedde, A. L., and G. H.	Routt.	Colorado.	Citation for contempt in disobeying injunction; pending resurvey of land.
Walker, R. T.	Harney.	South Dakota.	Bill filed; pending.

Occupancy trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911.

CRIMINAL—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Character of trespass.	Status June 30, 1911.
Hopkins, F. J., and Keller, W.	Coeur d'Alene.	Idaho.	Conducting saloon on unperfected mining claim in violation of regulations for administration of national forests.	Pledged guilty after demurrer overruled, and Hopkins fined \$195; Keller, \$5.
Rizzinelli, B. and C.	do.	do.	do.	Pledged guilty after demurrer overruled, and B. Rizzinelli fined \$195; C. Rizzinelli, \$5.
Santry, Ed., and Cullhane, J. C.	do.	do.	do.	Demurrer to indictment overruled; dismissed upon settlement of civil suit.
Setser, L., and Lynch, Wm.	do.	do.	Conducting saloon on deceased squatter's location.	Pledged guilty, after demurrer overruled, and fined \$100 each.
Fourt, W.	Chiricahua.	Arizona.	Unlawful inclosure.	Pending.
Henry, C. F.	Humboldt.	Nevada.	Unlawful use of mining claim.	do.
Tindell, T. D.	do.	do.	do.	do.
Tate, R. R.	do.	do.	do.	do.
Matlive, J. D.	do.	do.	do.	do.
Dale, R. R.	do.	do.	do.	do.
Powers, L. M.	do.	do.	do.	do.
Jenkins, J. D.	do.	do.	do.	do.
Baty, R. R.	do.	do.	do.	do.

Occupancy trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911—Continued.

CIVIL—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Character of trespass.	Status June 30, 1911.
Central Colorado Power Co...	Holy Cross.....	Colorado.....	Construction of power plant and conduit without permit.	Pending.
Eastern Colorado Power Co...	Pike.....	do.....	do.....	Do.
Telluride Power Co.....	Montezuma.....	do.....	do.....	Temporary injunction granted; pending.
Beaver River Power Co.....	Fillmore.....	Utah.....	do.....	Pending.
Telluride Light & Power Co...	Cache.....	do.....	do.....	Do.
Utah Light & Railway Co.....	Wasatch.....	do.....	do.....	Do.
Grand Canyon Cattle Co.....	Kaibab.....	Arizona.....	Procurement of patent to land illegally.	Do.
Gum, H. S.....	Weiser.....	Idaho.....	Including land without permit.	Do.
Safe Investment Gold Mining Co.	Black Hills.....	South Dakota.....	Procurement of patents to land illegally.	Do.
Goemmer & Goemmer.....	San Isabel.....	Colorado.....	do.....	Suit filed; pending.
Curtis, Collins & Holbrook, et al.	Piomas.....	California, northern district.....	do.....	Do.
Harris, S. J.....	Sierra.....	California, southern district.....	Occupancy of land on claim adverse to United States.	Pending on demurrer.
Grover, H. M.....	Eldorado.....	California, northern district.....	Procurement of patent to land illegally.	Pending on answer.
Hydro-Electric Co.....	Mono.....	California, southern district.....	Construction of pipe line without permit.	Injunction pendente lite granted.
Jenkins-Castoe Mining Co....	Santa Barbara.....	California, southern district.....	Occupancy of land on claim adverse to United States.	Pending on demurrer.
Linton, H.....	Klamath.....	California, northern district.....	do.....	Do.
Marting, A.....	Monterey.....	do.....	Procurement of patent to land illegally.	Pending answer.
Mason, C.....	California.....	do.....	Occupancy of land for saloon purposes and adverse to United States.	Suit filed; pending.
Mason, P. S.....	Stanislaus.....	do.....	Occupancy of land on claim adverse to United States.	Dismissed; saloon removed.
Siskiyou Electric Power Co...	Klamath.....	do.....	do.....	Pending.
Utassum, M. and E.....	Santa Barbara.....	California, southern district.....	do.....	Pending on demurrer.
Higley, R. L. and A. V.....	Olympic.....	Washington, northern district.....	do.....	Judgment for Government and defendants ejected.
Mestas, C.....	Pecos.....	New Mexico.....	Occupancy of mining claim for saloon purposes in violation of regulations for administration of national forests.	Complaint filed; pending.
Sanury, Ed., and Cullhane, J. C.	Coeur d'Alene.....	Idaho.....	Procurement of patent to land illegally.	Saloon discontinued on filing of bill.
Biggers, D. C.....	Olympic.....	Washington, western district.....	do.....	Judgment for United States cancelling patent.
Clearwater Lode Co.....	Washington.....	do.....	do.....	Suit filed; pending.
Smith, D. C.....	Oregon.....	Oregon.....	do.....	Judgment for United States cancelling patent.

GENERAL LITIGATION—REPORTED TO THE ATTORNEY GENERAL.

Wiedenbohm and Gieschen.. Bishop, H	Pocatello..... Coeur d'Alene.....	Idaho..... do.....	Theft of property of the United States. Attempt to bribe Forest officer to return false report on a homestead claim.	Convicted; each sentenced to 90 days in jail. Indicted; not yet apprehended.
Lawrence, T. A..... Phillips, Ben	Pend Oreille..... Kootenai.....	do..... Montana.....	Embezzlement..... Forgery of indorsement on Government check ..	Do. Pleaded guilty, fined \$100, and committed to jail for 90 days.
Grimes, D. A	District 7	Iowa.....	Personating officer of the Forest Service in sale of catalpa trees.	Convicted; fined \$25.
Erickson, A., Grey, A. C., and Urner, B.	Gallatin.....	Montana.....	Breach of bond to secure purchase of timber.....	Settlement made by sureties.
La Motte, W. L.....	Olympic	Washington, eastern district.	Interference with use of Alder Creek for adminis- trative purposes.	Brief for injunction filed; pending.
Tuley, J. F	District 6.....	Oregon.....	Theft of property of the United States.....	Bound over by Commissioner for grand jury.

Fire trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911.

CRIMINAL—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Status June 30, 1911.
Adams, Downing, and King.	Crater.....	Oregon.....	Indicted; pending.
Bailey, F., and Moore, D.	do.....	do.....	Do.
Dennis, W. S.	Fremont.....	do.....	Plead guilty; fined \$25.
Fisher, S. B.	Colville.....	Washington, eastern district.	Convicted; fined \$250.
Gardner, E. G.	Siskiyou.....	Oregon.....	Plead guilty; sentences suspended.
Gregg, J. H.	Cascade.....	do.....	No true bill.
Hinkle, Walter, and Teal	Whitman.....	do.....	Do.
Kirri, Frank.	Crater.....	do.....	Convicted; sentenced to 60 days in jail.
Lyda, J. D.	Okanogan.....	Washington, eastern district.	Plead guilty; fined \$58.50.
Mott, C. P.	Chelan.....	do.....	No true bill.
Ramsey, Wm.	Umpqua.....	Oregon.....	Do.
Bruno and Price.	Deerlodge.....	Montana.....	Do.
Farr, Wm.	Coeur d'Alene.....	Idaho.....	Do.
Miller, A. H.	do.....	do.....	Do.
Cummins, T. R.	Sierra.....	California, southern district..	Pending for preliminary examination.
Clay, Henry.	Cleveland.....	do.....	Convicted; sentenced to 4 months in jail.
Deal, John E.	Tahoe.....	do.....	Pending.
Longfellow, Henry.	Cleveland.....	do.....	Acquitted.
Walston, Philip.	Weiser.....	Idaho.....	Complaint filed; pending.
McDonald, Archie.	Salmon.....	do.....	Released on hearing before commissioner.
Vansickle, Jesse.	Sawtooth.....	do.....	Do.
Hoisington, Ira.	Harney.....	South Dakota.....	Pending.
Boysinger, H. J.	Ozark.....	Arkansas, eastern district..	Verdict for defendant directed; no violation of the statute.
Brown and Floyd.	Arkansas.....	Arkansas, western district..	Not guilty.
Cross, Henry.	Ozark.....	Arkansas, eastern district..	Convicted; sentenced to 60 days in jail.
Kinnear, A.	Coconino.....	Arizona.....	Discharged by commissioner.
Lawrence, James.	Arkansas.....	Arkansas, western district..	Indicted; pending.
Ott, Andrew.	Ozark.....	Arkansas, eastern district..	Pending.
Plum, S. and C.	Arkansas.....	Arkansas, western district..	Discharged by commissioner.
Pugh, Wm. F.	do.....	do.....	Pending.
Rawls, T. J.	do.....	do.....	Discharged by commissioner.
Ward, J. T.	Ozark.....	Arkansas, eastern district..	Indicted; indictment quashed; to be resubmitted to grand jury.
Whitson, J. R.	Arkansas.....	Arkansas, western district..	Convicted; sentenced to 1 hour in jail.
O'Connor, J. E.	Sequoia.....	California, northern district..	Commissioner released defendant on parole.
Posky, A. R.	Kaniksu.....	Washington, eastern district.	Bound over for hearing before commissioner.

CRIMINAL—PROSECUTED IN STATE COURTS.

Comstock, P.	Cleveland.....	California.....	Convicted; fined \$25.
Fely, Joe.	Monterey.....	do.....	Pending.
Gorden, Ray.	Angeles.....	do.....	Do.
Heid, C.	do.....	do.....	Committed by juvenile court on 3 years' probation.
Hughalett, J.	Shasta.....	do.....	Committed to insane asylum pending prosecution.
Longstreet, L.	Angeles.....	do.....	Committed by juvenile court on 3 years' probation.
Lewis, R.	do.....	do.....	Convicted; fined \$15.
McCorkall, R.	do.....	do.....	Committed by juvenile court on 3 years' probation.
Marre, L.	Santa Barbara.....	do.....	Acquitted.
Manpus, J.	Shasta.....	do.....	Plead guilty; fined \$25.
Poppus, T.	do.....	do.....	Plead not guilty; dismissed.
Richie, Jeff.	Tahoe.....	do.....	Convicted; fined \$25.
Shaw, W. K.	Angeles.....	do.....	Do.
Shirk, G.	do.....	do.....	Do.
Thompson, J. E.	do.....	do.....	Convicted; fined \$15.
Washer, P. M.	Cleveland.....	do.....	Convicted; fined \$100.
Widaman, J.	Angeles.....	do.....	Convicted; fined \$15.
Winchester, R. E.	Lassen.....	do.....	Convicted; fined \$25.
Whitten, V.	Angeles.....	do.....	Do.
Bonett, Nate.	Coeur d'Alene.....	Idaho.....	Convicted; sentenced to 90 days in jail.

Fire trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911—
Continued.

CRIMINAL—PROSECUTED IN STATE COURTS—Continued.

Trespasser.	National Forest.	Judicial district.	Status June 30, 1911.
Telenger, Emil.....	Gallatin.....	Montana.....	Committed by justice of peace.
Turner, Sherman.....	Coeur d'Alene.....	Idaho.....	Acquitted.
Boysinger, H. J.....	Ozark.....	Arkansas.....	Do.
Osh Kee.....	Coconino.....	Arizona.....	Convicted; fined \$30 or committed to jail 30 days.
Kellow, Orley.....	Suislaw.....	Oregon.....	Pleaded guilty; fined \$25.

CIVIL—REPORTED TO THE ATTORNEY GENERAL.

Corvallis & Eastern Ry. Co.	Oregon.....	Oregon.....	Judgment for \$4,424.38; appeal pending.
Northern Pacific Ry. Co.	Snoqualmie.....	Washington, western district.	Verdict for \$5,500 set aside as excessive; pending.
Clarke, J. W.....	Pend Oreille.....	Idaho.....	Complaint filed for \$59.75; pending.
Great Northern Ry. Co.	Blackfeet.....	Montana.....	Suit for \$783.72; offer of compromise pending.
Chicago, Burlington & Quincy R. R. Co.	Black Hills.....	South Dakota.....	Settled by payment of \$6,750.
Missouri River & Northwestern R. R. Co.	.....do.....	.....do.....	Judgment for \$3,659.40 paid.
Denver, Northwestern & Pacific R. R. Co.	Arapaho.....	Colorado.....	Pending on defendant's demurrer.
La Sarre, J. G.....	Sundance.....	Illinois, northern district.....	Suit pending.

CIVIL—ADMINISTRATIVE SETTLEMENT.

Yokum, Joe.....	Wenatchee.....	Washington, eastern district.	Settled by payment of \$500.92.
Comstock, P.....	Cleveland.....	California, southern district..	Settled by payment of \$25.
Esmeralda Quicksilver Mining Co.	Monterey.....	California, northern district..	Settled by payment of \$87.50.
Henry, John.....	Palisade.....	Idaho.....	Pending.

Grazing trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911.

CIVIL—ADMINISTRATIVE SETTLEMENT.

Trespasser.	National Forest.	Kind and number of stock.	Value of forage consumed.	Status June 30, 1911.
The Ames Sheep Co....	Beaverhead.....	1,340 sheep.....	\$93.80	Paid.
Armijo, Policarpio.....	Jemez.....	5,000 sheep.....	28.75	Do.
Austin Bros. Co.....	Humboldt.....	2,650 sheep.....	159.00	Do.
Bartlett, C. P.....	Targhee.....	22 horses.....		Reinvestigation developed extenuating facts; no settlement required.
Becker, Jerry.....	Sawtooth.....	3,400 sheep.....	68.00	Paid.
Betty, G. H.....	Lemhi.....	2,300 sheep.....	34.50	Payment demanded.
Bleake Bros.....	Apache.....	12 cattle.....	8.05	Do.
Brown, Albert G.....	Custer.....	122 cattle.....	10.98	Paid.
Campbell, Albert and Arthur.	Weiser.....	100 cattle.....	10.50	Do.
Campbell, Francis & Co.	Prescott.....	1,000 sheep.....	10.00	Payment demanded.
Carrizozo Cattle Ranch Co.	Lincoln.....	1,100 sheep.....	17.46	Do.
Do.....	.....do.....	69 cattle.....	20.70	Paid.
Chipman, Squire.....	Pocatello.....	4,000 sheep.....	40.00	Payment demanded.
Clear Range Livestock Co.	Jefferson.....	2,100 sheep.....	27.61	Paid.
Cook & Payne.....	Minidoka.....	2,600 sheep.....	39.00	Do.
Cornett, R. C.....	Payette.....	1,375 sheep.....	19.15	Payment demanded.
Crittenden, H. S. and Frank.	Kansas.....	252 cattle.....	50.40	Paid.
Corta, Pedro.....	Humboldt.....	800 sheep.....	16.00	Payment demanded.

Grazing trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911—Continued.

CIVIL—ADMINISTRATIVE SETTLEMENT—Continued.

Trespasser.	National Forest.	Kind and number of stock.	Value of forage consumed.	Status June 30, 1911.
Dansie, C. N.....	Targhee.....	187 sheep.....	\$4. 67	Paid.
Darrab, Joe.....	Shoshone.....	1,700 sheep.....	8. 50	Do.
Diamond A. Livestock Co.	Humboldt.....	9,800 sheep.....	33. 60	Do.
Dontre, James and William.	Nevada.....	2,300 sheep.....	34. 50	Payment demanded.
Edwards, Thomas.....	Minidoka.....	275 sheep.....	4. 12	Do.
Espil, Martin.....	Modoc.....	1,600 sheep.....	88. 00	Do.
Gamier, E. M.....	Plumas.....	1,700 sheep.....	11. 32	Paid.
Garret, J. M.....	Prescott.....	1,500 sheep.....	11. 25	Do.
Gaviola, Manuel.....	Weiser.....	1,000 sheep.....	20. 00	Do.
Do.....	Payette.....	3,300 sheep.....	64. 17	Do.
Hatch, Joseph.....	Ashley.....	1,265 sheep.....	44. 27	Do.
Helton, A. M.....	San Juan.....	828 sheep.....	8. 28	Do.
Hennessy, John.....	Prescott.....	1,000 sheep.....	7. 80	Do.
Hermann, J. M.....	Sioux.....	625 sheep.....	14. 52	Do.
Hicks & Spoon.....	Plumas.....	.....	37. 00	Do.
Hotchkiss, A. N.....	Custer.....	.....	39. 20	Payment demanded.
Hubbell, Frank A.....	Datil.....	1,274 sheep.....	3. 19	Paid.
Do.....	do.....	2,000 sheep.....	15. 00	Do.
Hunt, James.....	Whitman.....	1,100 sheep.....	14. 67	Do.
Hyde, Orson.....	Ashley.....	1,265 sheep.....	44. 27	Payment demanded.
Jaquez, Juan N.....	San Juan (W).....	2,214 sheep.....	27. 65	Paid.
Jernigan, E. E.....	Alamo.....	60 cattle, 15 horses.	67. 50	Do.
Jorgensen, J. A.....	Fishlake.....	1,150 sheep.....	13. 00	Do.
Lathrop, A. C.....	Uncompahgre.....	900 cattle.....	15. 75	Do.
Lathrop, Howard.....	Tonto.....	2,000 sheep.....	100. 00	Do.
Lauterbach, Max.....	Deerlodge.....	.....	60. 00	Payment demanded.
Lister, Joe.....	Deschutes.....	53 cattle.....	56. 25	Paid.
Looney, Eugene.....	Weiser.....	1,200 sheep.....	100. 00	Do.
Luna, Solomon.....	Datil.....	2,000 sheep.....	15. 00	Do.
Do.....	do.....	7,365 sheep.....	73. 65	Do.
Do.....	do.....	5,000 sheep.....	12. 50	Do.
McKnight, John A. and E. C.	Uncompahgre.....	1,200 sheep.....	18. 00	Do.
Madsen, R. L.....	Fishlake.....	1,450 sheep.....	36. 00	Payment demanded.
Magleby Bros.....	Fillmore.....	2,000 sheep.....	30. 00	Paid.
Malone Sheep Co.....	Weiser.....	700 sheep.....	49. 00	Do.
Masse, Gabriel.....	Minidoka.....	2,000 sheep.....	25. 00	Payment demanded.
Mecham, H. & E.....	Cache.....	2,500 sheep.....	25. 00	Do.
Mills, J. J.....	Alamo.....	30 cattle.....	27. 00	Do.
Monro, C. E.....	Deschutes.....	1,500 sheep.....	20. 00	Paid.
Monloya, Juan F.....	Rio Grande.....	1,000 sheep.....	15. 00	Do.
Muir, Geo. H.....	Caribou.....	500 sheep.....	17. 50	Do.
Nelson, John.....	Crook.....	1,938 sheep.....	48. 45	Do.
Nelson Co., Thomas.....	Humboldt.....	1,578 sheep.....	7. 89	Do.
Pon Bros.....	Plumas.....	.....	28. 30	Do.
Potter, Henry E.....	Nebo.....	1,100 sheep.....	11. 00	Do.
Pradere, Martin.....	Plumas.....	880 sheep.....	5. 87	Do.
Richardson, C. V.....	Weiser.....	2,000 sheep.....	20. 00	Payment demanded.
Ricks, Thos. E. and Nathan.	Palisade.....	1,542 sheep.....	23. 13	Paid.
Robertson, C. R. and H. E.	Alamo.....	140 cattle.....	126. 00	Do.
Ryan, Jerry.....	Deerlodge.....	400 sheep.....	4. 00	Do.
Ryan & McKeown.....	Madison.....	200 sheep.....	50. 00	Do.
Schulze, Henry.....	Alamo.....	740 goats.....	7. 20	Payment demanded.
Segrest, R. P.....	do.....	50 cattle.....	13. 54	Paid.
Sheep Creek Livestock Co.	Beaverhead.....	2,631 sheep.....	100. 00	Do.
Smart & Webster Livestock Co.	Palisade.....	1,200 sheep.....	32. 00	Do.
Smith, M. A.....	Uinta.....	1,700 sheep.....	51. 00	Payment demanded.
Smith, Sam B.....	Alamo.....	40 cattle.....	48. 00	Do.
Spaulding, Frank.....	Palisade.....	1,475 sheep.....	22. 13	Do.
Spencer & Peterson.....	Nezperce.....	2,350 sheep.....	13. 00	Paid.
Thompson, Geo. W.....	San Juan.....	1,586 sheep.....	15. 86	Do.
Tipton, Wm.....	Alamo.....	12 horses.....	9. 00	Do.
Trainer, Hugh.....	Apache.....	18 cattle.....	26. 00	Payment demanded.
Ward, George.....	Minidoka.....	1,200 sheep.....	18. 00	Do.
Ward, John.....	do.....	600 sheep.....	9. 00	Do.
Wayne Bros.....	Alamo.....	180 cattle, 70 horses.	225. 00	Do.
Wellington, Richard.....	Wasatch.....	3,000 sheep.....	10. 00	Do.
Wilbur, G. H.....	Crook.....	2,001 sheep.....	50. 03	Paid.
Wilson, Rufus.....	Shoshone.....	1,400 sheep.....	42. 00	Payment demanded.

Grazing trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911—Continued.

CIVIL—REPORTED TO THE ATTORNEY GENERAL.

Trespasser.	National Forest.	Judicial district.	Kind and number of stock.	Value of forage consumed.	Status June 30, 1911.
Anduiza, Esteban..	Weiser.....	Idaho.....	2,400 sheep....	\$40.00	Settled by payment of \$40 actual and \$100 punitive damages and \$12.80 costs.
Blodgett & Bowles..	Palisade.....	do.....	1,700 sheep....	119.10	Settled by payment of \$119.
Cady, J. C., jr.....	Alamo.....	New Mexico..	135 cattle, 5 horses.	126.00	Settled by payment of \$126.
Cope, Sam.....	do.....	do.....	30 cattle, 11 horses.	75.00	Judgment for \$25 actual and \$75 punitive damages; not yet satisfied.
Curran, Marlin E. and John.	Sawtooth.....	Idaho.....	2,200 sheep....	33.00	Settled by payment of \$33 actual and \$167 punitive damages and costs amounting to \$22.60.
Fletcher, Wm A.....	do.....	do.....	2,300 sheep....	25.00	Pending.
Flynn, Daniel.....	Sopris.....	Colorado.....	448 cattle.....	37.00	Settled by payment of \$37 actual and \$50 exemplary damages.
Gallegos, Eugenio..	San Juan (E)..	do.....	2,300 sheep....	46.00	Settled by payment of \$46 actual and \$50 exemplary damages.
Geary, O. M.....	Sawtooth.....	Idaho.....	2,300 sheep....	147.00	Settled by payment of \$147 actual and \$100 punitive damages and costs amounting to \$13.
Gibbons Bros. & Loving.	Chelan.....	Washington, eastern district.	1,723 sheep....	34.46	Pending.
Healy, H. B.....	Wallowa.....	Oregon.....	900 sheep.....	224.00	Do.
Jacob & Purdy.....	do.....	do.....	27 horses.....	100.00	Do.
Jernigan, G. W.....	Alamo.....	New Mexico..	1,000 cattle, 100 horses.	990.00	Settled by payment of \$990.
Jernigan, R. N.....	do.....	do.....	185 cattle, 25 horses.	189.00	Settled by payment of \$189.
Jones, J. W.....	Tonto.....	Arizona.....	35 cattle.....	45.00	Pending.
Joy, Elihu.....	Alamo.....	New Mexico..	238 cattle, 33 horses.	406.50	Do.
Joy, Eugene.....	do.....	do.....	40 cattle, 4 horses.	43.50	Do.
King, H. W. and Ed.	Wenaha.....	Washington, eastern district.	521 sheep.....	10.00	Do.
Lister, Joe.....	Deschutes.....	Oregon.....	1,200 sheep....	6.43	Settled by payment of \$6.43 actual and \$50 punitive damages.
Do.....	do.....	do.....	1,200 sheep....	74.88	Settled by payment of \$74.88 actual and \$75 punitive damages.
Mitchell, H. L.....	Weiser.....	Idaho.....	6,000 sheep....	50.06	Pending.
Montgomery, W. F.	Alamo.....	New Mexico..	75 cattle.....	67.50	Do.
Newcastle Land & Livestock Co.	Sundance.....	Wyoming.....	3,000 sheep....	538.80	Do.
Newman, Edward..	Pocatello.....	Idaho.....	5,000 sheep....	175.00	Settled by payment of \$175 actual and \$100 punitive damages.
Parker, John.....	Alamo.....	New Mexico..	743 goats.....	182.78	Pending.
Do.....	do.....	do.....	20 cattle, 2 horses.	70.50	Judgment for \$70.50; not satisfied.
Parkinson, T. J.....	do.....	do.....	10 cattle.....	9.00	Pending.
Politea, Frank.....	Wallowa.....	Oregon.....	1,250 sheep....	111.16	Settled by payment of \$111.16 actual and \$100 punitive damages.
Spurgeon, Steven F.	Alamo.....	New Mexico..	150 cattle, 15 horses.	247.50	Pending.
Tinnen, J. H.....	do.....	do.....	325 horses.....	48.75	Do.
Tippett, Wm. P....	Wallowa.....	Oregon.....	820 horses.....	64.00	Judgment for \$64 actual and \$25 punitive damages and costs amounting to about \$100.
Wirt, Gomez & Co.	San Juan (E)..	Colorado.....	1,128 sheep....	29.86	Pending.
Withington, J. C..	Alamo.....	New Mexico..	20 cattle.....	18.00	Judgment for \$18.
Yellowstone Sheep Co.	Bonneville.....	Wyoming.....	1,000 sheep....	75.00	Pending.

Grazing trespass cases handled by the Solicitor during the fiscal year ended June 30, 1911—Continued.

CIVIL—INJUNCTION.

Trespasser.	National Forest.	Judicial district.	Kind and number of stock.	Status June 30, 1911,
Anduiza, Esteban..	Weiser.....	Idaho.....	2,400 sheep.....	Injunction granted.
Chewaucan Land & Cattle Co.	Deschutes.....	Oregon.....	1,160 cattle.....	Do.
Cope, Sam.....	Alamo.....	New Mexico.....	30 cattle 11 horses.	Do.
Farmer, James.....	Payetta.....	Idaho.....	100 stock.....	Do.
Flynn, Daniel.....	Sopris.....	Colorado.....	448 cattle.....	Settled by payment of \$37 and agreement to comply with regulations.
Jernigan, G. W.....	Alamo.....	New Mexico.....	1,000 cattle 100 horses.	Injunction granted.
Joy, Elihu.....	do.....	do.....	238 cattle, 33 horses	Pending.
Joy, Eugene.....	do.....	do.....	25 cattle, 4 horses..	Do.
Light, Fred.....	Holy Cross.....	Colorado.....	1,000 cattle.....	Judgment circuit court granting injunction sustained by the Supreme Court of the United States Mar. 1, 1911.
Montgomery, W. F.	Alamo.....	New Mexico.....	20 cattle.....	Pending.
Parker, John.....	do.....	do.....	20 cattle, 27 horses.	Injunction granted.
Worthington, J. C..	do.....	do.....	20 cattle.....	Do.

CRIMINAL—REPORTED TO ATTORNEY GENERAL.

Anduiza Esteban..	Weiser.....	Idaho.....	2,500 sheep.....	Fined \$50 and costs amounting to \$3.80.
Broderick, Thomas.	Black Hills (N)...	South Dakota.....	5,000 sheep.....	Nolle prossed.
Calsacarta, Joe.....	Weiser.....	Idaho.....	1,100 sheep.....	Fined \$100.
Cope, Samuel.....	Alamo.....	New Mexico.....	30 cattle, 11 horses.	No true bill.
Crenin, Dennis.....	Black Hills (N)...	South Dakota.....	5,000 sheep.....	Fined \$50 and costs.
Fenter, G. W.....	Garces.....	Arizona.....	100 cattle.....	Indicted; pending.
Fletcher, Wm. A.....	Sawtooth.....	Idaho.....	1,500 sheep.....	Information filed.
Anasteria, Gaviola.	Weiser.....	do.....	1,100 sheep.....	Fined \$25.
Geary, O. M.....	Sawtooth.....	do.....	4,900 sheep.....	Pending.
Grimaud, Pierre, and Carajous, J. P.	Sierra.....	California, southern district.	500 sheep.....	Judgment of district court quashing indictment reversed by Supreme Court of the United States May 1, 1911.
Hendricks, G. R.....	Sawtooth.....	Idaho.....	4,900 sheep.....	Pending.
Inda, Antonio.....	Sierra.....	California, southern district.	500 sheep.....	Judgment of district court quashing indictment reversed by Supreme Court of the United States May 1, 1911.
McKeon, Wm.....	Black Hills (N)...	South Dakota.....	5,000 sheep.....	Fined \$400 and costs.
Matson, Clarence.....	do.....	do.....	5,000 sheep.....	Fined \$50 and costs.
Mitchell, H. L.....	Weiser.....	Idaho.....	6,000 sheep.....	Fined \$25 and costs amounting to \$5.90.
Montgomery, W. F.	Alamo.....	New Mexico.....	75 cattle.....	No true bill.
Newman, Edward.....	Pocatello.....	Idaho.....	5,000 sheep.....	Fined \$25.
Ramsay, Cecil D.....	Sawtooth.....	do.....	1,200 sheep.....	Information filed pending.
Schillerstrom, Paul.	Humboldt.....	Nevada.....	1,400 sheep.....	Dismissed; evidence insufficient.
Seifert, Samuel.....	Pocatello.....	Idaho.....	5,000 sheep.....	Fined \$25.
Telfer, James.....	Lemhi.....	Idaho.....	1,200 sheep.....	Do.
Van Winkle, J. W.....	Alamo.....	New Mexico.....	1,000 sheep.....	Indicted; demurrer pending.
Wallace, James.....	Pocatello.....	Idaho.....	5,000 sheep.....	Fined \$25.
Wilson, J. C.....	Sawtooth.....	do.....	4,900 sheep.....	Pending.

CLAIMS CASES.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911.

DISTRICT NO. 1.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Adair, Lona.....	H. E.....	Clearwater.....	<i>Acres.</i> 160	Decision of register and receiver favorable to Government affirmed by Commissioner General Land Office.
Allen Co.....	M. S.....	Deerlodge.....	30	Referred to chief of field division.
Do.....	M. A.....	do.....	510.92	Reinvestigation directed by Forester.
Alpaundini, Olive (heirs).....	H. E.....	do.....	40	Adverse proceedings not suggested by Secretary of Agriculture.
American Gem Mining Syndicate.	M. A.....	Missoula.....	160	Adverse proceedings directed.
Do.....	M. A.....	do.....	132.34	Hearing held.
Ames, Roderick, A.....	H. E.....	Coeur d'Alene.....	160	Entry held for cancellation by General Land Office.
Anderson, C. H.....	Mineral location.	do.....	129.36	Adverse proceedings directed.
Anderson, Pete (High Sweeney administrator).	H. E.....	do.....	160	Canceled by Commissioner General Land Office.
Arthur, Alice.....	H. E.....	Coeur d'Alene.....	160	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior and entry approved for patent.
Auerbach, George S.....	M. S.....	do.....	121.85	Answer filed.
Baboff, Isaac J.....	H. E.....	do.....	160	Decision of register and receiver favorable to Government.
Bailey, A. F.....	Squatter.....	do.....	160	Decision of register and receiver favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Bard, Henry L.....	T. and S.....	do.....	160	Adverse proceedings directed.
Basin Mining Co.....	M. E.....	Missoula.....	81.69	Hearing held.
Beatty, S. B.....	M. A.....	Deerlodge.....	260	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office.
Beauchamp, Adelbert.....	H. E.....	Coeur d'Alene.....	160	Adverse report to chief of field division.
Beauchamp, Joseph.....	H. E.....	do.....	160	Claimant allowed 60 days to show cause why entry should not be canceled.
Bennett, William H.....	H. E.....	do.....	160	Entry reinstated under act of Mar. 3, 1911.
Do.....	H. E.....	do.....	160	Answer filed.
Berges, Hiram G.....	H. E.....	Kaniku.....	Approx. 105	Motion for new trial filed.
Berges, Lizzie.....	D. L. E.....	Jefferson.....	160	Hearing held.
Berges, Lizzie.....	D. L. E.....	do.....	320	Do.
Bishop, Lon E.....	M. S. M. E.....	Deerlodge.....	408.07	Do.
Blahop, Lon E.....	H. E.....	Clearwater.....	160	Do.
Blumack Nuggett Gulch Consolidated Mining Co.	M. E.....	Madison.....	Approx. 20	Decision of register and receiver by default affirmed by Commissioner General Land Office.
Do.....	M. E.....	do.....	11.2	Canceled by Commissioner General Land Office.
Do.....	M. E.....	do.....	17.35	Do.
Black Hawk Mining Co.....	M. E.....	do.....	16	Hearing ordered, but later indefinitely postponed.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 1—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Blashill, J. W.	D. L. E.	Jefferson.	<i>Acres.</i> 160	Decision of register and receiver favorable to claimant reversed by Commissioner General Land Office and entry held for cancellation.
Boucher, Nelson.	H. E.	Coeur d'Alene.	160	Reinvestigation directed by Commissioner General Land Office.
Boucher, Wilfred.	H. E.	do.	160	Decision of register and receiver favorable to Government.
Bowman, Sarah Annette.	H. E.	do.	160	Do.
Boyce, Thomas M.	H. E.	do.	160	Decision of Commissioner General Land Office favorable to Government modified by Secretary of Interior, subject to future compliance.
Branson, George A.	H. E.	do.	160	Answer filed by claimant.
Brett, George A.	H. E.	do.	160	Decision of register and receiver favorable to Government.
Brink, Levi.	H. E.	do.	160	Canceled by Commissioner of General Land Office.
Broadwell, Hazel.	H. E.	do.	160.36	Adverse report forwarded to chief of field division.
Brown, James A.	H. E.	Pend Oreille.	120	Hearing held.
Brown, George A.	H. E.	Cabinet.	120	Entry held for cancellation by Commissioner General Land Office.
Brown, Margaret C.	H. E.	Pend Oreille.	150	Decision of Commissioner of General Land Office favorable to Government affirmed by Secretary of Interior and case remanded for further hearing.
Bryan, William.	H. E.	Lolo.	160	Adverse proceedings directed by Commissioner of General Land Office.
Burden, Ella.	H. E.	Coeur d'Alene.	140	Decision of Commissioner General Land Office favorable to Government reversed by Secretary of Interior and entry approved for patent.
Burke, John H.	M. A.	Deerledge.	17.58	Commissioner General Land Office directs reinvestigation by special agent.
Burkett, Catherine I.	D. L. E.	Beaverhead.	320	Decision of register and receiver favorable to Government.
Burns, Charles E.	M. A.	Lolo.	197.79	Decision of register and receiver favorable to claimant reversed as to Tam O'Shanter lode and affirmed as to rest by Commissioner General Land Office.
Burris, John.	Squatter.	Jefferson.	120	Decision of register and receiver favorable to Government.
Bush, Walter N.	F. S., L. S.	Istena.	160	Charge attended by Commissioner General Land Office.
Balkan-Butte Copper Mining Co.	M. A.	Deerledge.	50.647	Adverse proceedings dismissed by Commissioner General Land Office.
Butterfield, Duane.	D. L. E.	Jefferson.	160	Adverse report to General Land Office.
Butte Oil Co.	M. A.	Blackfoot.	99.30	Decision register and receiver favorable to Government.
Butte Water Co.	M. S.	Deerledge.	122.555	Hearing held.
Calumet & Montana Mining Co.	M. A.	Beaverhead.	118.529	Patent issued. Chief field division requested to consider advisability of recommending proceedings to cancel patent.
Carey, Thomas E.	H. E.	Missoula.	160	Entry held for cancellation by Commissioner General Land Office for failure to apply for entry within prescribed period.
Carroll, Eugene, et al.	M. A.	Deerledge.	49.115	Action deferred by Commissioner General Land Office, pending determination of private contest.
Cathcart, Loftis L.	H. A.	Coeur d'Alene.	160	Adverse report to chief of field division.
Catron, A. E.	D. L. E.	Istena.	160	Hearing held.
Chaltee, Charles K.	H. E.	Kootenai.	160	Decision of Commissioner General Land Office favorable to Government affirmed by Secretary of Interior.

Chalney, Benjamin.....	H. E.	Coeur d'Alene.....	160	Decision register and receiver favorable to Government.
Cheney, Honoria.....	D. L. E.	Jefferson.....	300	Claimant applied for hearing.
Christie, Mary (heir of Hugh Christie).....	H. E.	Deerledge.....	100	Amended answer filed by claimant.
Clarke, C. W.....	L. S.	Bitterroot.....	640	Adverse proceedings directed.
Do.....	L. S.	Custer.....	120	Adverse proceedings directed on amended charges.
Clem, Noah.....	H. E.	Coeur d'Alene.....	175. 44	Decision register and receiver favorable to claimant.
Condes, Crawford.....	H. E.	do.....	100	Do.
Condes, Palmer.....	H. E.	do.....	100	Hearing held.
Colley, Mary A.....	H. E.	Kaniksu.....	100	Commissioner General Land Office directs issuance of final certificate.
Cole, Cyrus, et al.....	M. E.	Madison.....	51. 81	Canceled by Commissioner General Land Office.
Collar, L. L.....	Squatter	Kootenai.....	160	Claim held invalid by Commissioner General Land Office.
Collins, Freeman W.....	H. E.	Clearwater.....	160	Entry validated under act Mar. 3, 1911. Proof rejected subject to future compliance.
Collins, Peter M.....	L. S.	Flathead.....	160	Adverse proceedings suspended and reinvestigation directed by Commissioner General Land Office.
Do.....	L. S.	Jefferson.....	120	Adverse proceedings directed by General Land Office.
Condon, Richard N.....	H. E.	Coeur d'Alene.....	155. 36	Notice of charges issued.
Cook, Fern M.....	D. L. E.	Jefferson.....	100	Commissioner General Land Office directs hearing to determine rights of Holliday and Cook.
Cook, Garret A.....	D. L. E.	do.....	200	Referred to chief of field division.
Cook, George F.....	H. E.	Pend Oreille.....	160	Held for cancellation by Commissioner General Land Office.
Corry, A. V.....	M. E.	Deerledge.....	47. 85	Entry held for cancellation as to King Dodo; proceedings dismissed as to other claims.
Costa, Albert R.....	H. E.	Coeur d'Alene.....	160	Hearing set, but later indefinitely postponed.
Cox, J. A. W.....	H. E.	Clearwater.....	160	Entry canceled by Commissioner General Land Office. Entry reinstated under act of Mar. 3, 1911.
Crooks, Maud.....	H. E.	Bitterroot.....	160	Adverse proceedings directed.
Croston, Joseph.....	H. E.	Coeur d'Alene.....	160	Canceled by relinquishment.
Darrell, A. V.....	H. E.	Abstraka.....	80	Decision of register and receiver favorable to claimant affirmed by Commissioner General Land Office.
Daugherty, Joseph.....	H. E.	Coeur d'Alene.....	160	Answer and application for hearing filed by claimant.
Davaggio, John.....	H. E.	do.....	160	Decision of Commissioner General Land Office favorable to Government.
Davis, Elizabeth (nee McPhoe).....	H. E.	do.....	160	Decision of register and receiver favorable to Government.
Davis, Samuel T.....	H. E.	Kaniksu.....	160	Do.
Dayton, Nancy J.....	H. E.	Bitterroot.....	160	Entry canceled.
Decker, William H.....	H. E.	Michigan.....	80	Adverse proceedings directed.
Des Jarlins, Alphonse.....	H. E.	Coeur d'Alene.....	160	Entry held for cancellation by Commissioner General Land Office.
Des Voignes, Louis E.....	H. E.	Clearwater.....	160	Entry canceled by relinquishment.
Dotson, John.....	H. E.	Cabinet.....	160	Answer filed.
Downey, Jeremiah.....	H. E.	Kootenai.....	160	Do.
Downey, John P.....	H. E.	do.....	160	Referred to chief of field division.
Driscoll, Kathryn.....	H. E.	Clearwater.....	160	Decision of Commissioner General Land Office favorable to Government.
Duncan, A. L.....	Squatter	Lolo.....	160	Decision of Commissioner General Land Office favorable to Government.
Dykeman, Carrie M.....	T. and S.	Missoula.....	160	Entry held for cancellation by Commissioner General Land Office.
Earley, Eliza Maria (heir of).....	H. E.	Coeur d'Alene.....	160	Request for reinvestigation by Forester.
Earley, Maude Arama.....	H. E.	do.....	160	Adverse report forwarded to General Land Office.
Eby, Lucian L. (attorney in fact).....	M. S., M. E.	Beaverhead.....	640	Adverse proceedings directed.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 1—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Eclipse Argo Mining Co.....	M. A., M. S.....	Helena.....	<i>Acres.</i> 36,073	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office.
Edmundson, William A.....	H. E.....	Coeur d'Alene.....	120	Adverse proceedings directed.
Edwards, Townsend.....	H. E.....	Bitterroot.....	160	New proceedings directed.
Eiden, Thomas.....	Mineral location.....	do.....	20	Adverse proceedings directed.
Eidem, Thomas, et al.....	Mineral location.....	do.....	20	Do.
Elfvien, Lin A.....	D. L. E.....	do.....	160	Referred to chief of field division.
Eugstrom, Ed.....	H. E.....	Coeur d'Alene.....	80	Decision register and receiver favorable to claimant affirmed by Commissioner General Land Office and entry approved for patent.
Ensign, Edgar S.....	H. E.....	Bitterroot.....	166.10	Hearing held.
Evans, Carl.....	H. E.....	Pend Oreille.....	160.10	Entry clear-listed by Commissioner General Land Office.
Evans, Durgan.....	H. E.....	Coeur d'Alene.....	100	Decision register and receiver favorable to claimant.
Fallon, Joseph P.....	H. E.....	do.....	100	Decision register and receiver favorable to Government.
Felenger, Dora I.....	D. L. E.....	Absaroka.....	240	Entry canceled by Commissioner General Land Office.
Fergus Mining Co.....	M. S., M. A.....	Jefferson.....	112.4	Adverse proceedings directed.
Do.....	M. E.....	do.....	96,792	Hearing set, but later indefinitely postponed.
Ferguson, Lottie E.....	M. E.....	do.....	18,285	Adverse proceedings directed.
Fertig, Ida B.....	H. E.....	Coeur d'Alene.....	160	Adverse proceedings dismissed on recommendation of Forest Service.
Fields, Mary (widow of Fred Fields).....	H. E.....	Clearwater.....	160	Referred to chief of field division.
Fisher, John I.....	H. E.....	Coeur d'Alene.....	160	Hearing set, but later indefinitely postponed.
Fishhawk Consolidated Gold Mining Co.....	M. E.....	Nepesee.....	143,901	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior and entry approved for patent.
Follet, Edwin B.....	H. E.....	Michigan.....	160	Additional report submitted to General Land Office.
Fulkerson, Edwin V.....	H. E.....	Coeur d'Alene.....	160	Referred to chief of field division.
Fullerton, Wm.....	H. E.....	Bitterroot.....	160.38	Decision register and receiver favorable to claimant.
Gagnon, Frank.....	H. E.....	Kootenai.....	160	Adverse report forwarded to General Land Office.
Galloway Group Mining Co.....	M. E.....	Madison.....	38,028	Adverse proceedings dismissed by Commissioner General Land Office.
Garcas, Frank.....	M. A., M. E.....	Lolo.....	96,213	Hearing set, but later indefinitely postponed.
Geer, Mrs. Bessie E.....	D. L. E.....	Jefferson.....	280	Adverse proceedings directed.
Gerry, H. M., Jr., et al.....	M. A.....	Helena.....	152.57	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office. Defendant's motion for review denied by Secretary of Interior.
Gilloie, Alexander.....	Squatter.....	Coeur d'Alene.....	130	Decision register and receiver favorable to Government.
Gleason, George A.....	H. E.....	Clearwater.....	160	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Goldsmith, John F.....	H. E.....	Coeur d'Alene.....	194.19	Entry held for cancellation by Commissioner General Land Office.
Goslin, Louis.....	Squatter.....	Jefferson.....	160	Additional evidence requested.

Gragg, Charles.....	H. E.	Coeur d'Alene.....	160	Decision register and receiver favorable to claimant.
Graves, May.....	H. E.	Clearwater.....	160	Entry cleared by Commissioner General Land Office.
Grieco, Frank E.....	H. E.	do.....	160	Adverse report forwarded to chief of field division.
Grieco, Glen O.....	H. E.	do.....	160	Hearing held.
Griggs, Charles.....	H. E.	Coeur d'Alene.....	80	Decision Commissioner General Land Office favorable to Government affirmed by Secretary of Interior.
Groom, Alice.....	H. E.	Neprepe.....	140	Decision register and receiver favorable to Government.
Hager, Swan.....	H. E.	Kanikut.....	160	Entry approved for patent by Commissioner General Land Office.
Hahner, Henry.....	H. E.	do.....	160	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior and entry approved for patent.
Haight, John D.....	H. E.	Coeur d'Alene.....	145. 21	Secretary of Agriculture acquiesced in decision of Commissioner General Land Office clear-listing entry.
Hall, Andrew F.....	H. E.	do.....	80	Answer filed by entryman.
Hall, Matilda H.....	D. L. E.	Neprepe.....	240	Hearing set, but later indefinitely postponed.
Hamilton, Hiram M.....	F. L. S.	Superior.....	90	Adverse proceedings dismissed by General Land Office.
Hanson, Eben H.....	M. A.	Neprepe.....	61. 931	Hearing held.
Harri, John A.....	H. E.	Superior.....	140	Adverse report held insufficient by Secretary of Interior and entry approved for patent in absence of further showing.
Harris, Lyman C., and Taylor, John H.....	M. A.	Helena.....	55. 71	Decision of Commissioner General Land Office favorable to Government affirmed by Secretary of Interior and mineral application rejected. Motion for rehearing denied.
Harpoll, Adam.....	H. E.	Pend Oreille.....	160	Decision register and receiver favorable to Government.
Hellman, Harriet I.....	H. E.	Missoula.....	160	Adverse proceedings directed.
Hennessey, David W.....	H. E.	Flathead.....	160	Decision Commissioner General Land Office favorable to Government affirmed by Secretary of Interior and entry canceled. Motion for review overruled.
Hicks, Marion T.....	H. E.	Coeur d'Alene.....	160	Hearing set, but later indefinitely postponed.
Hill, Charles A.....	H. E.	do.....	160	Referred to chief of field division.
Hill, James J. (Samuel Barker, attorney-in-fact).....	M. A.	Helena.....	36. 771	Canceled by relinquishment.
Hill, James J.....	M. A.	do.....	15. 817	Application rejected and canceled upon relinquishment by Commissioner General Land Office.
Hines, Esther L.....	H. E.	Kanikut.....	160	Decision register and receiver favorable to claimant reversed by Commissioner General Land Office and entry held for cancellation.
Hinkto, G. W., et al.....	M. E.	Neprepe.....	38. 963	Do.
Hockett, Charles S.....	H. E.	Pend Oreille.....	160	Decision Commissioner General Land Office favorable to Government affirmed by Secretary of Interior.
Holliday, Charles M.....	D. L. E.	Jefferson.....	160	Order directing new hearing vacated by Commissioner General Land Office and entry canceled.
Holliday, Sanford M.....	D. L. E.	do.....	160	Hearing set, but later indefinitely postponed.
Hollis, Joseph O.....	H. E.	Kanikut.....	160	Decision register and receiver favorable to claimant.
Hone, Mining Co.....	M. S., M. A.	Jefferson.....	81. 065	Charges issued.
Hopp, Katie.....	D. L. E.	Beaverhead.....	160	Answer filed.
Horst & Powell.....	M. E.	Coeur d'Alene.....	7. 5	Decision register and receiver favorable to Government.
Hough, Alna.....	H. E.	Kanikut.....	160	Decision register and receiver favorable to claimant.
Hunsinger, Clyde.....	Squatter	Kootenai.....	160	Adverse proceedings dismissed.
Huntback, Thomas J.....	H. E.	Coeur d'Alene.....	160	Answer filed.
Hyde, F. A.....	L. S.	do.....	1, 120	Adverse proceedings directed under substitute charges by Commissioner General Land Office.
Do.....	L. S.	Lolo.....	1, 000	Do.
Hyde, F. A., and Collins, P. M.....	L. S.	Jefferson.....	80	Adverse proceedings directed by Commissioner General Land Office.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 1—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Hyde, F. A., & Co	L. S.	Lolo.	<i>Acres.</i> 160	Adverse proceedings directed under substituted charges by Commissioner General Land Office.
Do.	L. S.	do.	960	Supplemental report required of chief of field division.
Hyde, F. A.	L. S.	Jefferson.	80	Adverse proceedings directed.
Hyde, F. A., & Co	L. S.	Flathead.	400	Do.
Hyde, F. A.	L. S.	Coeur d'Alene.	40	Adverse proceedings directed under substituted charges by Commissioner General Land Office.
Do.	L. S.	Blackfeet.	160	Adverse proceedings directed.
Do.	L. S.	Flathead.	80	Do.
Hyde, F. A., & Co	L. S.	Kootenai.	80	Adverse proceedings directed under substituted charges.
Do.	L. S.	Flathead.	80	Adverse proceedings directed.
Hyde, F. A.	L. S.	Lolo.	360	Adverse proceedings directed under substituted charges.
Hyde, F. A., & Co	L. S.	do.	320	Hearing set, but later indefinitely postponed.
Jamison, James M., et al.	M. E.	Deerlodge.	100	Entry held for cancellation by Commissioner General Land Office. Decision made final.
Jamieson, William K.	H. E.	Clearwater.	80	Entry held for cancellation by Commissioner General Land Office. Decision register and receiver by default favorable to Government.
Jefferson Lime Co.	M. E.	Deerlodge.	158	Decision Commissioner General Land Office holding entry for cancellation affirmed by Secretary of Interior.
Jones, Charles B.	H. E.	Kaniksu.	160	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office.
Jordan, Clyde.	Squatter.	Kootenai.	160	Returned to district forester for lack of evidence upon which to base adverse proceedings.
Keiness, James A.	H. E.	Lolo.	160	Entry held for cancellation. Action deferred pending application under act June 11, 1906.
Kester, Mithra J.	H. E.	Jefferson.	200	Decision register and receiver favorable to Government.
Killian, Henry.	D. L. E.	Deerlodge.	120	Adverse proceedings directed.
Kirkendall, Ashley (Mark Kirkendall, heir).	H. E.	Jefferson.	160	Investigation by special agent directed.
Knight, George.	D. L. E.	Absaroka.	160	Default decision of register and receiver affirmed by Commissioner General Land Office, and case remanded for hearing by Commissioner.
Knowlton, Frank W.	Squatter.	Coeur d'Alene.	160	Decision register and receiver favorable to Government.
Lanagan, John.	T. and S.	Superior.	120	Decision register and receiver favorable to claimant as to 100 acres and canceling last 40 acres affirmed by Commissioner General Land Office.
Landusky, Julia.	D. L. E.	Jefferson.	160	Decision register and receiver favorable to claimant.
Larsen, Joseph, et al.	M. A., M. S.	Deerlodge.	140	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Lasalle, Samuel.	H. E.	Coeur d'Alene.	160	Do.
Latterell, Paul B.	H. E.	Kaniksu.	160	Adverse report forwarded to chief of field division.
Latterell, Samuel.	H. E.	do.	120	
Laundry, Joseph.	H. E.	Lolo.	120	

Lee, Norman.....	H. E.....	Flathead.....	120	Adverse report forwarded to General Land Office.
Libby Placer Mining Co.....	M. A.....	Kootenai.....	10,000	Application canceled in part by Commissioner General Land Office.
Lilly, Charles E.....	H. E.....	Coeur d'Alene.....	160	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry held for cancellation.
Linhnan, James G.....	H. E.....	Cabinet.....	160	Entry canceled by Commissioner General Land Office.
Long, Paul C.....	M. A.....	Lolo.....	40, 125	Decision register and receiver favorable to claimant reversed by Commissioner General Land Office and entry held for cancellation.
Lowery, Ed.....	Squatter.....	Coeur d'Alene.....	160	Decision register and receiver by default favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Lumsden, Clinton.....	H. E.....	Marquette.....	160	Do.
Lunsden, George.....	H. E.....	do.....	160	Hearing held.
McBride, Rudolph.....	H. E.....	Lolo.....	120	Answer filed.
McGregor, Charles D.....	H. E.....	Clearwater.....	160	Patent issued.
McHenry, Thomas.....	T. and S.....	Coeur d'Alene.....	160	Set for hearing, but hearing indefinitely postponed on account of insanity of claimant.
McIntosh, Nora.....	H. E.....	Kaniku.....	160	Entry held for cancellation by Commissioner General Land Office.
McMurtrie, Jerry L.....	H. E.....	Jefferson.....	160	Decision register and receiver by default favorable to Government affirmed by Commissioner General Land Office.
McNinch, Maria.....	D. L. E.....	Beaverhead.....	320	Referred to chief of field division.
Martin, Ozella (widow of Ad-dilor Martin).....	H. E.....	Coeur d'Alene.....	160	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Mathews, E. A., et al.....	Mineral location.....	Blackfeet.....	160	Referred to chief of field division.
Mayo, David P.....	T. and S.....	Lolo.....	120	Decision register and receiver favorable to claimant reversed by Commissioner General Land Office and entry held for cancellation.
Mead, Bert H.....	H. E.....	Kaniku.....	160	Adverse report forwarded to chief of field division.
Mendy, John G.....	L. S.....	Coeur d'Alene.....	160	Answer filed.
Miles, Rodolphus.....	H. E.....	do.....	159, 30	Entry canceled.
Miller, Christina J.....	D. L. E.....	Custer.....	120	Adverse proceedings directed.
Miller, Henry A.....	H. E.....	Coeur d'Alene.....	160	Answer filed.
Milton, Ella (for heirs of Wal-ter Milton).....	H. E.....	Blackfeet.....	160	Proof rejected, final certificate canceled, and entry held intact by Commis-sioner General Land Office.
Milum, Thomas K.....	H. E.....	do.....	80	Decision register and receiver favorable to Government affirmed by Com-missioner General Land Office.
Mirzask, George.....	M. A., M. S.....	Deerlodge.....	14, 445	Decision register and receiver favorable to Government affirmed by Com-missioner General Land Office.
Mitchell, Anna S.....	H. E.....	Coeur d'Alene.....	160	Answer filed.
Mitchell, Mary.....	T. and S.....	Lolo.....	120	Entry held for cancellation, but claimant allowed to apply for segregation of portion of area outside of the forest.
Monson, Charles.....	H. E.....	Coeur d'Alene.....	160	Hearing set, but later indefinitely postponed.
Montana United Mining Co.....	M. S.....	Helena.....	10, 35	Claim clear-listed.
Montana United Manufac-turing Co.....	M. A.....	do.....	113, 40	Patent issued.
Mortford, Frank.....	H. A.....	Coeur d'Alene.....	160	Adverse report forwarded to chief of field division.
Montgomery, Alexander.....	H. E.....	Lolo.....	160	Charges issued.
Moore, Lou A.....	D. L. E.....	Aburaka.....	280	Decision register and receiver favorable to claimant affirmed by Commis-sioner General Land Office.
Morris, H. M.....	L. S.....	Bitterroot.....	1,000	Adverse proceedings suspended and reexamination directed.
Morris, William C., et al.....	M. S.....	Madison.....	9, 324	Hearing held.
Morrison, J. W., et al.....	M. S.....	Pend Oreille.....	67, 837	Decision register and receiver favorable to Government.
Mountain Gem Mining Co.....	M. A.....	Lolo.....	276, 323	Hearing held.
Mumbrue, Daniel P.....	H. E.....	Jefferson.....	160	Entry approved for patent by Commissioner General Land Office.
Mumbrue, Victor H.....	H. E.....	do.....	160	Entry clear-listed by Commissioner General Land Office.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 1—Continued.

Claimant.	Character of claim	National Forest.	Quantity of land.	Status June 30, 1911
Musselshell Mining Co.....	M. A., M. S.....	Clearwater.....	<i>Acres.</i> 2,310	Answer filed.
Nash, Maurice.....	H. E.....	Coeur d'Alene.....	160	Decision register and receiver favorable to claimant.
New World Reduction & Power Co.....	M. S.....	Beartooth.....	Approx. 20.	Decision register and receiver by default favorable to Government.
Nihill, Margaret.....	D. L. E.....	Jefferson.....	160	Hearing held.
Noll, Theodore.....	H. E.....	Kaniksu.....	115	Adverse proceedings dismissed and entry held intact, subject to future compliance.
Northern Pacific lands.....	Secs. 47 and 48.....	Clearwater.....	3,480	Held for cancellation by Commissioner General Land Office.
Northern Pacific Ry. Co.....	M. C.....	Coeur d'Alene.....	10,848	Pending.
O'Brien, Maurice.....	H. E.....	Pend Oreille.....	160	Proceedings dismissed by Secretary of Interior
O'Brien, W. H., et al.....	M. A.....	Lolo.....	160	Notice of default decision of register and receiver served on claimants.
O'Connor, Michael.....	H. E.....	Kaniksu.....	160	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior and entry held for patent.
O'Connor, T. B.....	Mineral location.....	Coeur d'Alene.....	Approx. 20.	Adverse proceedings directed.
O'Hara, Pat (assignee of Matthew Skelton).....	D. L. E.....	Jefferson.....	120	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry held for cancellation.
Ogg, J. W.....	Squatter.....	Kootenai.....	160	Decision Commissioner General Land Office favorable to Government affirmed by Secretary of Interior.
Olson, Oscar R.....	H. E.....	Blackfoot.....	160	Entry approved for patent by Secretary of Interior.
Oom Paul Consolidated Mining Co.....	M. A.....	Coeur d'Alene.....	71.794	Answer filed.
Parsons, Alonzo.....	H. E.....	do.....	80	Final certificate authorized.
Patton, Edward F.....	H. E.....	Sioux.....	160	Judgment pro confesso by register and receiver.
Pease, Charles D.....	H. E.....	Kaniksu.....	160	Entry canceled by Commissioner General Land Office.
Pemberton, Charles D.....	H. A.....	Coeur d'Alene.....	160	Adverse report forwarded to chief of field division.
Peterson, Chris.....	H. E.....	Pend Oreille.....	160	Decision Commissioner General Land Office favorable to Government affirmed by Secretary of Interior and entry held for cancellation.
Peterson, Christina Hannal.....	H. E.....	do.....	160	Adverse proceedings directed.
Peterson, John.....	H. E.....	Sioux.....	160	Canceled by relinquishment by register and receiver.
Pohold, Michael.....	D. L. E.....	Jefferson.....	160	New proceedings ordered by Commissioner General Land Office.
Pollinger, E. M.....	M. E.....	Madison.....	A p p r o x . 29.71.	Decision register and receiver by default favorable to Government.
Pratt, J. W.....	M. A., M. S.....	Beaverhead.....	150	Adverse proceedings directed.
Price, William L.....	H. E.....	Bitterroot.....	160	Do.
Proud, Oscar E.....	H. E.....	Kootenai.....	160	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior.
Purcell, Charles.....	H. E.....	Pend Oreille.....	120	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Purdy, Lucy (née Garden).....	H. E.....	Coeur d'Alene.....	160.70	Decision register and receiver favorable to claimant.
Ranger, Thomas J.....	H. E.....	Pend Oreille.....	160	Decision register and receiver favorable to claimant affirmed by Commissioner General Land Office.

H. E.	Beartooth	40	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Reber, Caroline	40	Do.
Reber, Mary A.	80	Referred to chief of field division.
Reeves, C. H.	40	Adverse proceedings directed.
Roberts, Sarah F.	160	Entry canceled by Commissioner General Land Office.
Robicneau, Joseph	160	Decision register and receiver favorable to claimant.
Robillard, Joseph A.	160	Decision register and receiver holding entry for cancellation on proof affirmed by Secretary of Interior.
Rogers, Dana D.	160	Case submitted on agreed statement of facts.
Ross, David D.	120	Adverse proceedings directed.
Ruby Gulch Mining Co.	80, 510	Entry canceled by Commissioner General Land Office.
Rumbaugh, Lincoln H.	320	Stipulation filed by which claimant relinquished as to part.
Safely, Ida L.	160	Entry canceled as to part by Commissioner General Land Office and proceedings dismissed as to remainder.
Sandeno, Ole	160	Adverse report forwarded to General Land Office.
Schedin, Alfred E.	160	Hearing held.
Schlemlein, Louie	160	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior and entry held intact.
Schmitz, Winfred S.	160	Referred by chief of field division to Commissioner General Land Office.
School Indemnity Selections.	13, 309, 62	Decision register and receiver by default favorable to Government affirmed by Commissioner General Land Office and entry canceled.
Schroeder, Marie	320	Recommendation by chief of field division that no proceedings be instituted concurred in by Solicitor.
Schwiers, Ludwig	160	New investigation ordered.
Scott, Ada P.	160	Answer filed.
Seat, Adam L.	160	Decision register and receiver favorable to Government affirmed by Commissioner General Land Office and entry held for cancellation. Appeal pending.
Serret, Helen	160	Service of notice of charges on entryman directed after decision adverse to assignee.
Shannon, Thomas (assignee of Edward Peterson)	160	Adverse proceedings directed.
Shapard, Harry	73, 863	Do.
Sharper, Charles B.	40	Decision register and receiver by default.
Shaw, H. R., et al.	160	Held pending proper parties upon whom to serve notice.
Sheunan, Isabella, deceased (G. G. Bennett, lessee)	200	Entry held for cancellation by Commissioner General Land Office.
Shorman, Frank E.	160	Adverse proceedings directed.
Shofit, Mary E.	160	Decision register and receiver favorable to claimant reversed by Commissioner General Land Office.
Sinclair, H.	160	Adverse proceedings dismissed.
Sisk, Clinton	160	Commutation proof rejected and entry held intact subject to future compliance with law.
Smith, John G.	80	Adverse proceedings directed.
Smith, Walter B.	160	Proceedings dismissed by Secretary of Interior and entry approved for patent.
Snow Storm Mining Co.	4, 763	Patent issued.
Solberg, Charles	18	Defendant stipulates that default decision may be entered against him.
Somers, Birdie	160	Adverse report forwarded to chief of field division.
Stark, Walter A.	160	Entry held for cancellation by Commissioner General Land Office.
Stoll, Joseph	160	Adverse report forwarded to chief of field division.
Stoll, Joseph	160	Entry held for cancellation by Commissioner General Land Office.
Stoll, Joseph	160	Entry held for cancellation by Commissioner General Land Office.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 1—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Stone, Frank E.	H. E.	Kaniku.	<i>Acres.</i> 160	Decision Commissioner General Land Office holding entry for cancellation reversed by Secretary of Interior.
Stuart, George A.	H. E.	do.	160	Decision Commissioner General Land Office favorable to Government reversed by Secretary of Interior.
Stump, S. J.	H. E.	Coeur d'Alene.	160	Answer filed.
Sullivan, Mathew W.	H. E.	Bitterroot.	80	Proof and supplemental affidavit rejected by Commissioner General Land Office and entry held for cancellation.
Swinerton, William.	Squatter.	Coeur d'Alene.	160	Decision register and receiver by default favorable to Government.
Tash, Noah R.	D. L. E.	Missoula.	160	Decision register and receiver by default.
Taylor, Elizabeth Griffin.	H. E.	Clearwater.	160	Commissioner refused to direct proceedings and holds entry intact. Appeal from decision taken by Secretary of Agriculture.
Taylor, Hugh P.	H. E.	Coeur d'Alene.	160	Adverse report forwarded to chief of field division.
Thompson, Thomas L.	D. L. E.	Bitterroot.	160	Decision register and receiver rejecting final proof.
Three H. Place Co.	Mineral locations.	Madison.	2,560	Referred to chief of field division.
Tofrey, Helge.	H. E.	Superior.	160	Adverse proceedings directed.
Tozier, Claude A.	H. E.	Lolo.	160	Decision register and receiver favorable to claimant reversed by Commissioner General Land Office and entry held for cancellation.
Trask, Jane Pierre.	D. L. E.	Jefferson.	160	Reinvestigation directed by Commissioner General Land Office.
Tutor, Lumy E.	D. L. E.	Gallatin.	80	Proceedings dismissed by Commissioner General Land Office.
Tway, David R.	H. E.	Flathead.	160	Decision register and receiver favorable to claimant.
Van Buren, D. C.	Mineral location.	Nepesee.	600	Charges issued.
Van Horn, B. F.	Squatter.	Kootenai.	160	Decision register and receiver by default.
Van Salte, Eloise.	H. E.	Kaniku.	160	Decision Commissioner General Land Office favorable to claimant reversed by Commissioner General Land Office.
Von Der Weyer, Henry.	M. S., M. E.	Beartooth.	20	Closed on account of insufficient evidence upon which to base a contest.
Wagoner, David.	H. E.	Bitterroot.	160	Adverse proceedings directed.
Walaber, Andrew.	H. E.	Jefferson.	160	Entry held for cancellation by Commissioner General Land Office. Appeal pending.
Washburn, George R.	H. E.	Kaniku.	160	Decision register and receiver favorable to claimant reversed by Commissioner General Land Office and entry held for cancellation.
Waters, John M.	D. L. E.	Gallatin.	240	Entry clear listed under "surface rights" act of Mar. 2, 1909, and passed to patent with a reservation to United States of all coal deposits.
Watkins, Elsie.	H. E.	Clearwater.	160	Answer filed.
Webster, M. R. (assignee of Claude R. Moss).	D. L. E.	Missoula.	320	Hearing set but postponed on account of issuance of charges.
Wendal, John, et al.	M. A.	Helena.	56.73	Decision Commissioner General Land Office favorable to claimant made final.
West, Ed.	Squatter.	Flathead.	160	Answer filed.
Westfall, Otto.	H. E.	Lolo.	160	Adverse proceedings directed.
Weston, Warren.	H. E.	Coeur d'Alene.	160	Entry held for cancellation in General Land Office upon final proof showing.

Decision register and receiver canceling entry as to part affirmed by Commissioner General Land Office.
Report disposed of by Commissioner General Land Office without action.

Decision register and receiver favorable to Government.
Hearing held.

Adverse proceedings directed.
Supplemental report forwarded to Commissioner General Land Office.
Adverse proceedings dismissed and entry approved for patent.

Adverse report to Commissioner General Land Office.
Adverse proceedings directed on substituted charges.
Judgment by default.

Decision Commissioner General Land Office holding entry for cancellation upon final proof affirmed by Secretary of Interior. Motion for review denied and entry canceled.

DISTRICT NO. 2.

Willard, B. F.	D. L. E.	Sloux.	Acres.	Decision
Williams, Samuel, deceased (Lee Setser administrator).	Squatter.	Coeur d'Alene.	160	Decision register and receiver canceling entry as to part affirmed by Commissioner General Land Office. Report disposed of by Commissioner General Land Office without action.
Wilson, William Henry.	H. E.	do.	160	Decision register and receiver favorable to Government. Hearing held.
Wood, L. E.	M. A.	Missoula.	120	Adverse proceedings directed.
Woods, David.	D. L. E.	Beaverhead.	160	Supplemental report forwarded to Commissioner General Land Office. Adverse proceedings dismissed and entry approved for patent.
Woolsey, William, Jr.	D. L. E.	Absaroka.	40	Adverse report to Commissioner General Land Office. Adverse proceedings directed on substituted charges.
Wright, Mary A.	H. E.	Pend Oreille.	39.55	Judgment by default.
Wythe, Dixie M.	H. E.	Coeur d'Alene.	160	Decision Commissioner General Land Office holding entry for cancellation upon final proof affirmed by Secretary of Interior. Motion for review denied and entry canceled.
Yates, Charles M.	L. S.	Missoula.	160	
Young, W. H., Jr.	Mineral location.	Madison.	100	
Zelmann, Mettla H., (née Valles).	H. E.	Coeur d'Alene.	160	
Aldrich, L. W., et al.	M. E.	Pike.	10.331	Hearing held; register and receiver's decision in favor of Government; pending.
Allen, August.	D. L. E.	Sopris.	120	Canceled.
Anderson, Cooper.	M. E.	Montezuma.	20	Eliminated.
Anderson, N. E.	M. E.	Medicine Bow.	188.687	Canceled (by relinquishment).
Astle, G.	M. A.	Leadville.	320	Claimant defaulted; register and receiver's decision in favor of Government; pending.
Atwell, James W. and Clara.	C. C. E.	White River.	360	Hearing held; register and receiver's recommended cancellation; pending.
Baca, Louis.	H. E.	San Isabel.	160	Hearing held; register and receiver's decision in favor of claimant; pending.
Bailey, Robert M.	H. E.	Routt.	160	Adverse proceedings ordered; pending.
Bailey, Thomas E.	H. E.	Holy Cross.	120	Hearing held; register and receiver's recommended cancellation of entry; pending.
Bainbridge, T. A.	M. E.	Pike.	160	Hearing held; pending decision of register and receiver.
Barker, Clara.	H. E.	Durango.	160	Adverse proceedings ordered; pending.
Barton, Richard L.	H. E.	Medicine Bow.	160	Canceled.
Baudino, Charles.	H. E.	San Isabel.	160	Do.
Baudino, John.	H. E.	do.	160	Do.
Beckman, J. A.	C. C. E.	Gunnison.	160	Hearing held; register and receiver's decision for claimant; pending.
Becker, J. S.	H. E.	Pike.	160	Eliminated.
Do.	D. L. E.	do.	160	Do.
Belarde, Jose Estevan.	H. E.	San Isabel.	160	Hearing held; pending decision of register and receiver.
Belmonte, Thomas.	M. A.	Harney.	268.67	Proceedings ordered; pending.
Belzora-Basick Mining Co.	M. A.	Gunnison.	78	Hearing ordered; pending.
Do.	M. E.	do.	51	Do.
Do.	M. E.	do.	146	Do.
Do.	M. E.	do.	569	Do.
Benrose, William.	M. E.	Leadville.	157.66	Register and receiver's decision in favor of Government; pending.
Benedict, Angelo.	H. E.	San Isabel.	80	Eliminated.
Bisch, Raymond.	H. E.	do.	160	Proceedings ordered; pending.
Bivens, Clinton E.	D. L. E.	Routt.	160	Approved for patent.
Bivens, David R.	D. L. E.	do.	160	Do.
Bivens, Mary C.	D. L. E.	do.	120	Do.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 2—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Black Hills & Denver Gold Mining Co.	M. A.	Pike.	<i>Acres.</i> 20	Hearing; register and receiver's decision in favor of claimant; pending.
Blanchard, Richard.	M. A.	Gunnison.	10	Proceedings ordered; pending private contest.
Do.	M. A.	do.	20 475	Hearing held; pending.
Blanche Copper Co.	M. E.	Medicine Bow.	103.33	Relinquished.
Bodener, Wm.	M. L.	Harney.	20 66	Hearing postponed; reinvestigation being made; pending.
Bonnett, J. M. and J. C.	M. E.	Montezuma.	40	Adverse proceedings ordered; relinquished.
Bostick, H. B.	H. E.	San Isabel.	160	Approved for patent.
Bowman, Charles W.	H. E.	Durango.	160	Register and receiver's decision for Government; default of entryman; pending.
Boyer, Chas. F.	M. E.	Pike.	12 695	Hearing ordered; pending.
Breitel, Wm. J. and Alice M.	C. C. E.	White River.	200	Hearing held; register and receiver's decision for Government; pending.
Brewer, V. G.	T. and S.	Gunnison.		Canceled.
Broughton, Sidney.	D. L. E.	White River.	80	Favorable report by chief of field division; hearing set; continued; pending.
Brown, Mattie and C. L.	M. E.	Gunnison.	40	Proceedings ordered; pending.
Brown, G. R., et al.	M. A.	do.	46	Held for report by the Commissioner of the General Land Office; pending.
Brownlee, Bertha M.	H. E.	Montezuma.	160	Adverse report to chief of field division; final proof rejected; notice of expiration of 7 years ordered sent; pending.
Bruce, J. J.	H. E.	San Isabel.	160	Canceled.
Bullion Mining & Milling Co.	M. E.	Pike.	35.735	Do.
Bunte, Henry C.	M. A.	do.	60	Register and receiver's decision for claimant; pending.
Burbank, H. E.	M. L.	Harney.	20	Canceled.
Burgess, Elmer and Phoebe J.	C. C. E.	White River.	320	Hearing held; register and receiver's decision in favor of Government; pending.
Burgwin, Shirley O.	R. E.	Montezuma.	160	Canceled.
Burnham, C. F., et al.	M. E.	San Isabel.	320	Hearing held; claimant defaulted; pending decision.
Callahan, Jas. L.	M. E.	Black Hills.	90 978	Decision for Government on appeal to Secretary of Interior; canceled.
Campbell, Wm. H.	P. D. S.	Uncompahgre.	160	Hearing held; proceedings dismissed by commissioner.
Candia, Carey L.	H. E.	San Isabel.	160	Commissioner's decision canceling entry.
Candia, Felix S.	H. E.	do.	160	Do.
Carver, Minnie.	H. E.	do.	160	Eliminated.
Gary, Robert J.	T. and S.	Piute.	160	Approved for patent.
Gasto, Maulew.	H. E.	Uncompahgre.	160	Adverse proceedings ordered; pending.
Chambers, Mattie W.	T. and S.	San Juan.	158.97	Clear listed on special agent's report.
Charter Raton M. & M. Co.	M. A.	Pike.	87.79	Rejected.
Chief, William.	T. C. E.	Battlement.	160	Proceedings ordered; pending.
Cisneros, Antonio.	H. E.	San Isabel.	40	Commissioner's decision canceling entry.
Clark, Lizzie.	D. L. E.	Colorado.	80	Extension denied; proof filed; suspended; pending.
Clark, Sidney M., et al.	M. A.	Arapaho.	160	Canceled.

Clough, W. P.	M. A.	Pike.	95,657	Proceedings ordered; action suspended until private contest is adjudicated by General Land Office; pending.
Do.	M. A.	do.	47	Canceled.
Cogan, James	H. E.	Montezuma.	160	Favorable report by special agent.
Colorado Gold Dredging Co.	M. A.	Leadville.	752,185	Report to General Land Office; case pending reexamination.
Colorado Smelting & Mining Co.	M. A.	Gunnison.	307	Adverse proceedings ordered; pending.
Connerford, John D.	H. E.	Black Hills.	160	Pending on appeal to Secretary of Interior by claimant.
Cook, Henry	H. E.	Routt.	160	Register and receiver's decision for Government; claimant appealed; pending.
Copeland, Aggie E.	D. L. E.	Sopris.	235	Proceedings ordered; pending.
Copeland, William S.	D. L. E.	do.	258,25	Do.
Copper Six Mining Co.	M. A.	Pike.	38,405	Do.
Cox, Mary E.	H. E.	San Isabel.	160	Eliminated.
Crown Syndicate M. & M. Co.	M. E.	Pike.	174,982	Proceedings ordered; pending.
Creutz, Juan D.	H. E.	San Isabel.	160	Canceled.
Curry, Ed M.	D. L. E.	Routt.	160	Eliminated.
Cutler, Almon.	H. E.	San Isabel.	160	Do.
Davis, W. J., and Goodrich, W. E.	M. E.	Pike.	10	Proceedings ordered; pending.
Demerout, James, and Robinsons, C. W.	M. L.	Harcny.	30	Hearing postponed; Secretary of Agriculture requested that proceedings be discontinued; pending.
Dewing, Wm. S.	M. A.	do.	130,118	Proceedings ordered; pending.
Deer, Joseph.	H. E.	San Isabel.	160	Held for cancellation by Commissioner of General Land Office; commissioner's decision concerning entry.
Dolphin, Fred M.	P. D. S.	Uncompahgre.	120	Relinquished.
Doolley, Thomas.	H. E.	Leadville.	79,95	Register and receiver's decision recommending cancellation on default of claimant; pending.
Douglas Gold & Copper Co.	M. E.	Medicine Bow.	103,16	Hearing held; pending.
Dowl, J. W.	M. E.	Holy Cross.	160	Canceled.
Dowell, Gertrude.	H. E.	San Juan.	160	Do.
Dredley, L. G.	H. E.	Montezuma.	160	Eliminated.
Dutton Consolidated Mines Co.	M. A.	do.	30	Clear listed by Commissioner of General Land Office; claimant filed motion for rehearing of Secretary's decision; pending.
Eckbert, W. H., and Pearson, A. J.	M. E.	Gunnison.	30	Hearing held; pending.
Elchem Mining Co.	M. L.	Leadville.	330	Canceled.
Ellis, Fannie L.	D. L. E.	Routt.	160	Eliminated.
Ertson, Joseph.	H. E.	Montezuma.	160	Adverse proceedings ordered; pending.
Zwell, Henry C.	H. E.	Arapaho.	160	Application to withdraw proof denied; entry held for cancellation by Commissioner of General Land Office; pending.
Foster, Arthur A.	H. E.	San Isabel.	160	Eliminated.
Forbeck, Lars E.	P. D. S.	Uncompahgre.	160	Do.
Fowler, George H.	H. E.	San Isabel.	160	Report to chief of field division; reinvestigation being made by General Land Office; pending.
Fowler, Wm. H.	H. E.	do.	160	Report to chief of field division; notice of expiration of statutory period to issue; pending.
Fox, Chas.	M. E.	Leadville.	45,231	Rejected in part; patent issued as to remainder.
Frasar, Wm.	H. E.	do.	7,997	Application rejected.
Frye, John C.	H. E.	Routt.	160	Approved for patent.
Furness, Mary J.	D. L. E.	Sopris.	280	Hearing postponed; pending.
Gamer, Charles.	C. D. S.	Gunnison.	160	Hearing held; register and receiver's decision for claimant; pending.
Galassino, Petronilla.	T. and S.	San Isabel.	160	Eliminated.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 2—Continued.

Claimant.	Character of claim	National Forest.	Quantity of land.	Status June 30, 1911
Galleros, Julian.....	H. E.	Rio Grande.	<i>Acres.</i>	Canceled.
Gantz, Jacob S.....	M. A.	Black Hills.	100	Hearing held; pending taking further testimony.
Garcia, Consolacion.....	H. E.	San Juan.	40	Register and receiver's decision for claimant; pending.
Garcia, Jose Ignas.....	H. E.	Rio Grande.	160	Canceled.
Gervais, Jennie Martinez.....	H. E.	San Juan.	160	Do.
Gillis, C. L., et al.....	M. A.	Black Hills.	31.18	Hearing held; pending decision of register and receiver.
Gillespie, William E.....	H. E.	Routt.	160	Proceedings ordered; pending.
Goezner, Gustavus A.....	H. E.	San Isabel.	160	Approved for patent.
Gomez, Jose Luis.....	H. E.	Rio Grande.	160	Canceled by relinquishment.
Gordon, James.....	H. E.	Black Hills.	160	Do.
Gutshall, Harry P.....	H. E.	Uncompahgre.	160	Canceled by relinquishment; closed.
Guymon, James O.....	H. E.	Rio Grande.	160	Hearing held; register and receiver's decision for Government; pending
Gwynn, Edward.....	H. E.	Stoshone.	160	Hearing postponed for reexamination; pending.
Hamm's Peak Gold Mining & Milling Co.....	M. E.	Routt.	61.986	Relinquished.
Hansen, Christian W.....	H. E.	Rio Grande.	160	Hearing held; claimant defaulted; decision by register and receiver in favor of claimant; pending.
Harbach, Charles, et al.....	M. S.	Harney.	40	Report to General Land Office; pending.
Harney Peak T. M. M. & Mfg. Co.....	M. E.	do.	145.11	Canceled by Secretary of Interior.
Do.....	M. L.	do.	80	Register and receiver's decision for Government; pending.
Harpending, Linley.....	H. E.	Gunnison.	160	Proceedings dismissed at request of Department of Agriculture.
Harvest G. M. Co.....	M. L.	Black Hills.	60	Register and receiver's decision in favor of Government; appeal filed; pending.
Henault, Denis.....	H. E.	Harney.	40	Canceled by commissioner.
Do.....	M. E.	do.	40	Report to General Land Office; pending.
Hercules Gold Mining Co.....	M. A.	Black Hills.	75.278	Canceled.
Herlyck, Angus W.....	H. E.	San Isabel.	160	Entry approved by Secretary of Interior.
Herlyck, L. C.....	H. E.	do.	160	Eliminated.
Herrera, Maria Rita.....	H. E.	do.		Hearing postponed; pending.
Hicks, Robert E.....	H. E.	Arapaho.	160	Adverse proceedings ordered; pending.
Hoskinson, Alice.....	H. E.	Nebaska.	160	Hearing held; register and receiver's decision for claimant; pending.
Howell, John.....	H. E.	Montezuma.	160	Hearing held; pending decision of register and receiver.
Humphrey, I. M., and Stenget, Ed.....	M. E.	Harney.	120	Eliminated.
Hurd, Bayley L.....	H. E.	Montezuma.	160	Hearing held; pending.
Independent Gold Mining Co.....	M. E.	Gunnison.	98.253	Eliminated.
Ingersoll, Maj. S.....	H. E.	Black Hills.	147	Hearing held; pending.
Interstate Gold Mining & Milling Co.....	M. A.	Harney.		

Ireland, Isaac.....	II. E.....	Black Hills.....	160	Hearing held; claimant defaulted; register and receiver's decision for Government; pending.
Jermillo, Jose Ma.....	II. E.....	Rio Grande.....	27.85	Adverse report to chief of field division; adverse proceedings ordered; pending.
Johnson, R. C.....	M. E.....	Pike.....	120	Eliminated.
Johnson, S. R.....	C. E.....	Routt.....	82.044	Cancelled.
Jupiter Mining Co.....	M. E.....	Medicine Bow.....	147.72	Hearing; register and receiver's decision for Government; pending.
Kearns, Thos. J.....	II. E.....	Sopris.....	148.83	Cancelled.
Kearns, George T.....	M. E.....	Pike.....	160	Hearing held; final hearing postponed awaiting taking of further testimony; pending.
Kempel, Joseph.....	II. E.....	Black Hills.....	160	Application for reinstatement rejected by commissioner.
King Solomon T. & M. Co.....	M. A.....	Leadville.....	160	Adverse proceedings ordered; register and receiver directed to proceed.
Do.....	M. A.....	do.....	160	pending.
King Solomon T. & D. Co.....	M. E.....	do.....	15.331	Report to General Land Office; proceedings ordered; pending
Do.....	M. A.....	do.....	110.06	Dismissed at request of Department of Agriculture.
Kirk, Frank L. and Elisha L.....	M. E.....	Harney.....	140	Commissioner's decision for claimant.
Kitchen, Chas.....	II. E.....	San Isabel.....	160	Proceedings ordered; pending.
Knapp Mining Co.....	M. E.....	Hayden.....	82.208	Cancelled.
Knuth, Bertha.....	T. and S.....	San Isabel.....	160	Hearing held; pending decision of register and receiver.
Knuth, Helmut.....	T. and S.....	do.....	160	Entry canceled by Secretary of Interior; motion for review denied by Secretary of Interior; application for reinstatement; pending.
Kron, Frank, et al.....	M. E.....	Gunnison.....	160	Do.
Latia, James, et al.....	M. E.....	do.....	3.702	Proceedings dismissed at request of Department of Agriculture.
Letter, Frank J.....	II. E.....	Durango.....	160	Hearing held; commissioner's decision rejecting application; reexamination to be made; pending.
Lennox, John C.....	II. E.....	San Juan.....	160	Cancelled.
Lewis, Rosa A.....	II. E.....	Sundance.....	80	Register and receiver's decision for claimant; pending.
Lincoln M. M. & T. Co.....	M. E.....	Pike.....	27.948	Adverse report to chief of field division; pending.
Linney, J. F.....	C. D. S.....	Gunnison.....	160	Hearing continued for further testimony; pending.
Lucero, Maria Dolores.....	II. E.....	Rio Grande.....	160	Hearing held; register and receiver's decision in favor of claimant; pending
Lujan (now Lusero) Fede.....	II. E.....	do.....	160	Cancelled.
Lusher, William J.....	II. E.....	Leadville.....	160	Adverse report to chief of field division; pending.
Lyree, Henry C.....	II. E.....	Montezuma.....	160	Cancelled.
McBride, A. C.....	II. E.....	Black Hills.....	160	Report to General Land Office; pending.
McIntire, A. S.....	M. E.....	San Isabel.....	10.331	Proceedings dismissed by Assistant Commissioner of General Land Office; appeal to Secretary of Interior filed; pending.
McKay, D. J., et al.....	M. E.....	Pike.....	140	Adverse proceedings ordered; pending.
McKnight, Elijah C.....	P. D. S.....	Uncompahgre.....	120	Adverse proceedings ordered; pending.
McLean, Albert N.....	II. E.....	San Isabel.....	160	Do.
McNeal, Fay A.....	T. and S. C. E.....	San Juan.....	160	Default decision for Government rendered; rehearing applied for; pending.
MacVatters, D. C.....	C. D. S.....	Gunnison.....	160	Hearing held; register and receiver's decision for claimant; pending.
Madrid, Teofilo.....	II. E.....	Rio Grande.....	160	Approved for patent.
Maez, Sarah.....	II. E.....	San Juan.....	160	Report to chief of field division; pending.
Martinez, Alcarita.....	II. E.....	San Isabel.....	160	Proceedings ordered; pending.
Martinez, Daniel.....	II. E.....	San Juan.....	160	Register and receiver's decision for Government; eliminated.
Matt, Katrina.....	M. E.....	Harney.....	108.29	Hearing; register and receiver's decision for claimant; pending.
Maxwell, Chas A.....	II. E.....	Colorado.....	160	Report to chief of field division, awaiting offer of final proof; pending.
Maxwell, James D.....	T. and S.....	do.....	160	Patent to issue; mineral land excluded; pending.
Maxwell, Mary A.....	T. and S.....	do.....	160	Do.
Merrill, Abel M.....	T. and S.....	Routt.....	120	Protest withdrawn by Secretary of Agriculture; approved for patent by Commissioner of General Land Office; closed.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 2—Continued

Claimant	Character of claim	National Forest	Quantity of land.	Status June 30, 1911.
Mile High Mining & Milling Co.	M. L.	Harney	<i>Acres.</i> 100	Hearing held; register and receiver's decision that they had no jurisdiction; pending.
Miller, C. J., et al.	M. E.	Black Hills	45.96	Hearing set; postponed for reexamination; pending.
Miller, John A.	M. A.	Black Hills	160	Register and receiver's decision for claimant; pending.
Mills, William H.	H. E.	do	45	Canceled.
Mint Mining & Milling Co.	M. E.	Leadville	160	Do.
Molnar, Peter	H. E.	San Isabel	13.802	Eliminated.
Montgomery Mining & Milling Co.	M. E.	Leadville	100	Hearing ordered and postponed; pending.
Montoya, Celestino	H. E.	Rio Grande	100	Canceled.
Montoya, Manuel	H. E.	San Juan	100	Approved for patent
Montoya, Manuel	H. E.	Rio Grande	100	Proceedings ordered; pending.
Mook, Joseph M.	H. E.	Sundance	100	Approved for patent.
Morgan, Nora S.	D. L. E.	Routt	100	Adverse proceedings ordered; pending.
Morris, Lincoln G.	H. E.	San Isabel	100	Eliminated.
Morrison, John	M. E.	Pike	7.046	Supplemental report submitted; objection to patent withdrawn by Secretary of Agriculture; pending.
Mortenson, Andrew	H. E.	Rio Grande	100	Canceled by commissioner.
Muller, John (Smith, Barney)	H. E.	San Isabel	100	Eliminated.
Murphy, Merritt, and Cook, S. L.	M. E.	Harney	20	Hearing; defendants in default; pending.
Murphy, Merritt	M. L.	do	20	Canceled.
Myers, Jas. H.	M. E.	Leadville	5.165	Adverse proceedings ordered; supplemental report submitted with request that proceedings be withdrawn; pending report by chief of field division.
Myhre, Leonard	H. E.	Sundance	100	Canceled by commissioner.
Nagle, Patrick	H. E.	Black Hills	160	Do.
Neighbors, James H.	H. E.	Sundance	160	Proceedings dismissed at request of Department of Agriculture.
Nicholson, J. W., et al.	M. A.	Gunnison	10	Former adverse report to General Land Office supplemented by favorable report; pending.
Norman, A.	H. E.	San Isabel	80	Canceled by commissioner.
Ocana, Dolores	H. E.	do	100	Canceled by relinquishment.
Olgron, Eneacron	H. E.	do	100	Register and receiver's decision for Government on failure of claimant to apply for hearing; no appeal; pending commissioner's decision.
Olson, Ole M.	H. E.	Medicine Bow	160	Canceled.
Omar G. M. & T. Co.	M. E.	Pike	119.015	Commissioner's decision holding entry for cancellation in part; claimant appealed; pending.
O'Meara, Sam P.	M. L.	Washakie	2,080	Proceedings ordered; pending.
Ostrom, Chas., et al.	M. A.	Harney	80	Hearing ordered and postponed for reexamination; pending.
Peer, Ferdinand	H. E.	Bighorn	100	Canceled by Secretary of Interior.
Peterson, Eunice	H. E.	Uncompahgre	160	Adverse report to chief of field division; pending.

Pittsburg Mining Co.	M. E.	Harney	20	Register and receiver's decision for Government affirmed by commissioner, pending.
Do.	M. E.	do.	34, 45	Proceedings dismissed at request of Department of Agriculture.
Pollard, Gordon T.	T. and S.	Arapaho.	80	Clear-listed at request of Department of Agriculture.
Potter, D. D.	C. E.	Routt.	160	Patented.
Prohitt, John W.	H. E.	Cochetopa.	160	Canceled by commissioner.
Proper, Carl.	H. E.	Montezuma.	160	Eliminated.
Putnam, Hannah.	M. A.	Pike.	30, 697	Commissioner's decision for Government modified by Secretary of Interior; protest by Forest Service withdrawn; pending.
Quayl, Wm. A.	M. A.	Black Hills.	68	Report to General Land Office; protest withdrawn by Secretary of Agriculture; pending.
Ragan, J. B., et al.	M. L.	Cochetopa.	228, 13	Canceled.
Ramsay, Davis E.	H. E.	Durango.	160	Do.
Randall, Alton D.	H. E.	Hayden.	160	Eliminated.
Reeves, Charles M. (Curry, Margaret)	D. L. E.	Routt.	160	Do.
Reynolds, Albert E.	M. A.	Rio Grande.	26, 418	Clear-listed at request of Department of Agriculture.
Rice, Calvin L.	H. E.	Montezuma.	160	Approved for patent.
Rice, Emma F.	M. E.	Pike.	40, 975	Register and receiver's decision in favor of Government; pending.
Robinson, R. O.	M. E.	Black Hills.	215, 19	Proceedings ordered; pending.
Rose, Wm. L.	P. D. S.	Gunnison.	160	Clear-listed by commissioner.
Rowe, Richard T.	H. E.	San Isabel.	160	Adverse report to chief of field division; pending.
Raybal, Jose Benito.	H. E.	Rio Grande.	160	Canceled.
Ryan, William F.	C. D. S.	Gunnison.	160	Hearing held; register and receiver's decision in favor of claimant; pending.
Saginaw Gold Mining Co.	M. L.	Harney.	380	Hearing held; defendants admit facts as charged and demur to jurisdiction; pending.
Sawyer, John F.	M. E.	Black Hills.	119, 045	Hearing held; pending.
Schneider, J. D.	M. E.	Pike.	80	Register and receiver's decision for Government; reversed by commissioner; supplemental report; rehearing ordered; pending.
Schmitzler, John (estate of)	M. L.	Black Hills.	60	Proceedings dismissed at request of Department of Agriculture.
Shelhamer, Edwin N.	H. E.	Durango.	8, 418	Proceedings ordered pending final proof.
Shepherd, E. E.	M. E.	Black Hills.	90	Hearing held; proceedings dismissed by commissioner.
Sherman, J. C., and Frank.	M. L.	do.	160	Proceedings dismissed at request of Department of Agriculture.
Shoecraft, Wm. H.	C. D. S.	Gunnison.	160	Hearing held; register and receiver's decision for claimant; pending.
Shropshire, Clyde E.	P. C. E.	Battlement.	160	Proceedings ordered; pending.
Shumlin, George E.	C. D. S.	Gunnison.	160	Hearing held; register and receiver's decision for claimant; pending.
Sims, Isabdo.	H. E.	Sundance.	143	Hearing; held for cancellation by register and receiver; pending.
Smith, Clara P. and Clifford P.	C. E.	Sundance.	320	30 days allowed by General Land Office in which to furnish application to purchase; pending.
Smith, Emma.	H. E.	Sundance.	160	Canceled.
Smith, Frank S.	H. E.	Bonneville.	160	Do.
Smith, George A.	P. C. E.	Uncompahgre.	160	Hearing held; proceedings dismissed by commissioner.
Smith, Harvey M.	H. E.	Routt.	160	Proceedings dismissed at request of Department of Agriculture.
Sotle, Jesse.	H. E.	White River.	80	Proceedings ordered; pending.
Sparks, Edna E.	H. E.	San Juan.	160	Hearing; pending.
Sparks, Forrest H.	H. E.	do.	160	Hearing; register and receiver's decision in favor of Government; appeal by claimant; pending.
Sparks, Harry L.	H. E.	do.	160	Hearing; pending.
St. Paul Gold Mining Co.	M. A.	Pike.	135	Adverse report to General Land Office; supplemental report to General Land Office; adverse as to Woodbury, Warner, Hussey, and Rosser only; rejected by commissioner as to these four; clear listed as to remainder at request of Department of Agriculture.
Swank, Robert R.	H. E.	Montezuma.	160	Eliminated.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 2—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Sweeten, Calvin M.	H. E.	San Isabel	<i>Acres.</i>	Canceled by commissioner.
Telluride Power Co.	M. A.	Montezuma	429.21	Eliminated.
Terrill, Frank	H. E.	Holy Cross	100	Register and receiver's decision for Government; pending.
Thompson, Clyde M.	H. E.	Montezuma	100	Adverse proceedings ordered; pending.
Thompson, John A.	H. E.	do.	100	Canceled by commissioner.
Thompson, John Thomas	H. E.	Arapaho	100	Do.
Treas, Richard	P. D. S.	Uncompahgre	100	Patent to issue.
Tuttle, E. G.	M. A.	Leadville	.....	Part relinquished; clear listed at request of Department of Agriculture as to remainder.
Do.	M. A.	do.	80	Part relinquished; remainder clear listed at request of Department of Agriculture.
Valesques, Juan C.	H. E.	Cochetopa	100	Canceled.
Valdez, Jose P.	H. E.	Rio Grande	100	Register and receiver's decision for Government; pending.
Vance, John H.	M. E.	Harney	82.644	Hearing; register and receiver's decision for claimant; pending.
Vandusen, S. A.	H. E.	Routt	100	Canceled.
Vasquez, Alvin O.	H. E.	San Isabel	80	Hearing held; proceedings dismissed.
Verley, Elmer	M. E.	Black Hills	138.81	Canceled.
Victoria Mining Co.	M. E.	Medicine Bow	64	Hearing; register and receiver's decision in favor of Government; pending.
Vigil, Pedro Jose	H. E.	San Isabel	100	Hearing; pending.
Wabash M. & M. Co.	M. E.	Harney	340	Hearing held; claimants in default; allowed 60 days within which to file new application for hearing; pending.
Wade, John	H. E.	Montezuma	100	Eliminated.
Wagner, Adam S.	H. E.	Arapaho	100	Canceled.
Wales, Martha E.	H. E.	Montezuma	100	Proceedings ordered; pending.
Ward, Isaac	H. E.	Uncompahgre	100	Approved for patent; closed.
Watkins, Eleanor N.	H. E.	Routt	100	Proceedings ordered; hearing applied for; pending.
Watkins, John M.	H. E.	Montezuma	.....	Eliminated.
Watson, L. D.	H. E.	Colorado	100	Report to General Land Office. Issuance of statutory expiration notice directed; pending.
Webster, D. W., trustee	M. A.	Harney	183.216	Proceedings ordered; pending.
Wells, Bulkeley	M. E.	Montezuma	474.804	Eliminated.
Westinghouse Electric Manufacturing Co.	M. E.	Harney	240	Hearing held; pending.
Westover, J. H., et al.	M. E.	do.	100	Register and receiver's decision in favor of Government; pending.
Whipples, Edward C.	T. and S.	Pigdon	40	Canceled.
Wincher, Roy	H. E.	Sundance	100	Adverse proceedings ordered; pending.
Willburt, Edward A.	H. E.	San Isabel	80	Hearing held; proceedings dismissed by commissioner.
Wilson, George J.	H. E.	do.	150	Eliminated.
Wilson, Mary	H. E.	Uncompahgre	100	Adverse proceedings ordered; pending.
Winner, John W.	M. A.	Hayden	.....	Do.

DISTRICT NO. 3.			Acres.		Do.
Wolfe, Jennie.....	H. E.....	Montezuma.....	150	6	
Wright, John T.....	H. E.....	Black Hills.....	150		Approved for patent.
Wright, Samuel J.....	P. C. E.....	Uncompangre.....	160		Adverse proceedings ordered; pending.
Young & McKnight.....	M. E.....	Holy Cross.....	160		Canceled.
Zancanetta, Batista.....	H. E.....	San Isabel.....	160		Eliminated.
Zimmerman, Eda.....	H. E.....	Colorado.....	160		Held for cancellation by Commissioner of General Land Office; pending.
DISTRICT NO. 3.			Acres.		Do.
Abbott, J. H.....	H. E.....	Arkansas.....	160		
Adams, John G.....	H. E.....	do.....	160		Canceled after hearing.
Abbott, Wm. T.....	H. E.....	do.....	160		Relinquished before hearing.
Adams, Shelton.....	H. E.....	do.....	160		Decision local land office favorable to United States; pending General Land Office.
Adobe Springs lode.....	M. L.....	Colorado.....	20		Canceled before hearing.
Alford, Jos.....	H. E.....	Florida.....	160		Annulled after hearing.
Alford, Wm. T.....	H. E.....	do.....	160		Canceled after hearing.
Allen, F. E.....	H. E.....	Arkansas.....	160		No objection issuance of final certificate.
Allen, G. J.....	H. E.....	do.....	160		Decision local land office favorable to United States; pending General Land Office.
Allen, J. H.....	H. E.....	do.....	160		Canceled on proof showing.
Allen, J. M.....	H. E.....	do.....	160		Adverse report pending General Land Office.
Alta May placer.....	M. L.....	Wichita.....	80		Relinquished before hearing.
America Nos. 4 and 5 lodes.....	M. E.....	Colorado.....	160		Annulled after hearing.
Anderson, H. C.....	H. E.....	Ozark.....	40		Relinquished before hearing.
Ansel placer.....	M. L.....	Manzano.....	160		Adverse report pending General Land Office.
Apple, Lina C.....	M. E.....	Arkansas.....	20		Annulled before hearing.
Arbitration et al. lodes.....	H. E.....	Crook.....	120		Adverse report pending General Land Office.
Arrington, J. R.....	H. E.....	Arkansas.....	40		Decision local land office favorable to United States; pending General Land Office.
Ayers, Mrs. J. D.....	H. E.....	Gila.....	160		Canceled on default.
Baca, Alejandro.....	H. E.....	Manzano.....	160		Decision local land office favorable to United States; pending action by defendant.
Bach, Alfred.....	H. E.....	Arkansas.....	160		Canceled after hearing.
Baker, E. B.....	H. E.....	do.....	160		Canceled on default.
Baker, L. M.....	H. E.....	Ozark.....	160		Lands eliminated.
Baker, R. M.....	H. E.....	do.....	160		No objection issuance of final certificate.
Ballard, Wm. H.....	T. and S.....	do.....	160		Do.
Bardwell, J. D.....	H. E.....	Arkansas.....	100		Hearing held; pending decision local land office.
Barlow, Thos.....	H. E.....	do.....	160		Adverse proceedings dismissed.
Barnard, Wm. E.....	H. E.....	do.....	160		Relinquished after default.
Barnes, John.....	H. E.....	do.....	160		Hearing held; pending decision local land office.
Barreras, Clamico.....	H. E.....	Gila.....	160		Relinquished before hearing.
Bayley, A. G.....	H. E.....	Arkansas.....	160		Canceled on record showing.
Baylis, Archie.....	H. E.....	do.....	80		Canceled on default.
Beals, J. H.....	H. E.....	do.....	160		Do.
Beals, Wm. O.....	H. E.....	do.....	160		Do.
Beatty, D. P.....	H. E.....	do.....	160		Adverse proceedings directed; pending General Land Office.
Bernight, P. P.....	H. E.....	do.....	160		Canceled on default.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 3—Continued

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Berry W. C.	H. E.	Ozark.	80	Canceled on default.
Berta, Pietro	H. E.	Arkansas.	100	Decision local land office favorable to United States; pending General Land Office.
Betson, Thos.	H. E.	do.	100	Canceled on default.
Bishop, J. F. M.	H. E.	Florida.	160	Decision local land office favorable to United States; pending General Land Office.
Bishop, R. L.	H. E.	Arkansas.	40	Canceled on default.
Dismark lodge.	M. L.	Wichita.	20	Annulled on default.
Blackman, J. F.	H. E.	Florida.	160	Proof rejected; entry held intact.
Blind Tiger lodge.	M. L.	Prescott.	20	No reason for proceedings prior to M. A. (in mineral cases).
Bewn, M. S.	H. E.	Ozark.	100	Relinquished before hearing.
Bohannon, J. J.	H. E.	do.	100	Decision local land office favorable to United States; pending General Land Office.
Bohn, S. S.	H. E.	Arkansas.	80	Adverse report pending General Land Office.
Boling, A. W.	H. E.	do.	100	Adverse proceedings directed; pending local land office.
Booker, S. H.	H. E.	do.	100	Hearing held; pending decision local land office.
Rosewell, Garrison.	H. E.	do.	100	Canceled on default.
Bottoms, E. L.	H. E.	do.	160	Lands eliminated.
Boulter et al. placer.	M. L.	Prescott.	60	Annulled on default.
Boyle, Isaac W.	T. and S.	Arkansas.	160	Patent issued.
Bozarth, Asa.	H. E.	Prescott.	160	Relinquished before hearing.
Bradford, Nick D.	H. E.	Ozark.	160	Lands eliminated.
Bradford, Wm. H.	H. E.	Alamo.	80	Canceled on default.
Brage, T. E.	H. E.	Lincoln.	160	Relinquished before hearing.
Brewer, J. H.	H. E.	Ozark.	160	Lands eliminated.
Diggs place.	M. L.	Carson.	80	Annulled on default.
Brinkley, H. F.	H. E.	Arkansas.	160	Canceled on default.
Brock, V. S.	H. E.	Ozark.	160	Lands eliminated.
Brooks, Geo. B.	H. E.	Florida.	100	Remanded to local land office.
Brown, J. M.	H. E.	Ozark.	100	Decision local land office favorable to United States; pending General Land Office.
Bruner, W. D.	H. E.	Florida.	160	Adverse report pending General Land Office.
Dryan, John.	H. E.	Arkansas.	80	Relinquished before hearing.
Bryant, Alfred.	H. E.	Ozark.	160	Canceled on default.
Bunch, John W.	H. E.	do.	160	Hearing held; pending decision local land office.
Burdon, Reace.	H. E.	do.	100	Lands eliminated.
Burgess, J. S.	H. E.	do.	160	Decision local land office favorable to United States; pending General Land Office.
Buskirk, Geo.	H. E.	Arkansas.	160	Canceled on default.
Button, J. S.	H. E.	Cocino.	100	Relinquished before hearing.

Bryers, W. O.	T. and S.	Arkansas.	160	Hearing held; pending decision local land office.
Cagle, Wm. F.	H. E.	Ozark.	160	Remanded to local land office; there pending.
Cain, J. W.	H. E.	Arkansas.	160	Decision local land office favorable to United States; pending General Land Office.
Campbell, P. W.	H. E.	do.	160	Canceled on default.
Capslaw, J. S., heirs.	H. E.	do.	160	Canceled after hearing.
Carlisle, C. F.	H. E.	do.	160	Canceled on default.
Carlton, J. F.	H. E.	Ozark.	160	Canceled after hearing.
Carlton, M. E (heir of Nancy Pierce).	H. E.	do.	160	Hearing held; pending decision local land office.
Carr, C. M.	D. L. E.	Zuni.	320	Relinquished before hearing.
Carrejo, Domingo.	H. E.	Silgreaves.	160	Lands eliminated.
Carter, Chas.	H. E.	Arkansas.	160	Decision local land office favorable to United States; pending General Land Office.
Carter, R. O.	H. E.	do.	120	Adverse report; pending General Land Office.
Casoy, Elias J.	H. E.	Ozark.	160	Relinquished before hearing.
Caughman, F. R.	H. E.	Arkansas.	160	Pending report of supervisor.
Chamberlain, Jos.	H. E.	do.	160	Proof rejected by General Land Office.
Chastaine, J. H.	H. E.	do.	160	Adverse proceedings directed; pending General Land Office.
Chatham, W. H.	H. E.	Arkansas.	40	Canceled on record showing.
Chavez, J. H.	H. E.	Lincoln.	160	Relinquished after hearing.
Chestnut, L. E.	H. E.	Florida.	160	Pending report of supervisor.
Clark, Anson.	H. E.	do.	160	Proof rejected by General Land Office.
Clark, C. W.	L. S.	Chiricahua.	40	Adverse proceedings directed; pending General Land Office.
Clawson, J. H.	H. E.	Arkansas.	160	Canceled after hearing.
Clayborn, J. T.	H. E.	Ozark.	80	Adverse proceedings directed; pending General Land Office.
Cleveland placer.	M. E.	Pecos.	160	Patent issued.
Close, Alice L.	H. E.	Arkansas.	160	Canceled on default.
Cochise White Marble placer.	M. A.	Chiricahua.	144	Hearing held; pending decision local land office.
Cogburn, Rebecca J.	H. E.	Arkansas.	80	Decision General Land Office favorable to United States; pending action by defendant.
Cogburn, Wm. J.	H. E.	do.	160	Canceled after hearing.
Collum, Chas. H.	H. E.	Florida.	160	Canceled after hearing.
Columbus lode.	M. L.	Whitla.	20	Adverse report; pending General Land Office.
Consolidated No. 2 placer.	M. A.	Ozark.	160	Adverse proceedings directed; pending local land office.
Consolidated No. 5 placer.	M. A.	do.	160	Decision local land office favorable to United States; pending General Land Office.
Consolidated Big Springs et al. placers.	M. A.	do.	160	Hearing held; pending decision local land office.
Contention et al. lodes.	M. E.	Prescott.	100	Patented; proceedings to vacate being considered.
Converse, Edith.	H. E.	Arkansas.	80	Relinquished after hearing.
Conway, J. H.	T. and S.	do.	160	Hearing held; pending decision local land office.
Cooney placer.	M. L.	Gila.	160	Canceled on default.
Cooper, John R.	H. E.	Arkansas.	40	Do.
Cooper, R. A.	H. E.	Ozark.	70	Canceled; statutory period expired without proof.
Copper Bell et al. lodes.	M. E.	Chiricahua.	25	Relinquished after hearing.
Copper Queen et al. lodes.	M. L.	Gila.	40	Lands eliminated.
Cortier, Chas. M.	H. E.	Ozark.	160	Canceled on proof showing.
Cornelius, Martha.	H. E.	Arkansas.	160	Hearing held; pending decision local land office.
Cottonwood lode.	M. E.	Prescott.	20	Adverse proceedings dismissed.
Courts, Clarence.	T. and S.	Arkansas.	160	Hearing held; pending decision local land office.
Courts, S. P.	T. and S.	do.	160	Do.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 3—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Cowan, J. R.	H. E.	Ozark.	Acres.	Lands eliminated.
Crabtree, Robert.	H. E.	Manzano.	160	Adverse report pending General Land Office.
Cross, G. L.	H. E.	Arkansas.	160	Canceled on default.
Crowley, S. J.	T. and S.	do.	160	Patent issued.
Cumbie, W. H.	H. E.	do.	160	Adverse proceedings directed; pending local land office.
Curtis, B. L.	H. E.	do.	160	Decision local land office favorable to United States; pending General Land Office.
Curtis, J. B.	H. E.	Alamo.	160	Do.
Dadeville et al. lodes.	M. A.	Crook.	11	Adverse proceedings directed; pending local land office.
Darlington, Alfred.	H. E.	Tonto.	140	Proof rejected; entry held intact.
Davis, Jas. W.	H. E.	Ozark.	160	Adverse report pending General Land Office.
Davis, Jesse H.	H. E.	do.	120	Lands eliminated.
Davis, W. M.	H. E.	Arkansas.	160	Relinquished after default.
Dearney, John.	H. E.	do.	160	Decision local land office favorable to United States; pending General Land Office.
Decker, Louis.	D. L. E.	Sitgreaves.	160	Hearing held; pending decision local land office.
Delk, C. R.	H. E.	Arkansas.	80	Relinquished before hearing.
Della, P. A.	H. E.	do.	120	Adverse report pending General Land Office.
De Moss, John.	H. E.	Alamo.	160	Canceled on default.
Deshazo, Marvin.	H. E.	Florida.	160	No objection to issuance of final certificate.
Dodson, R. S.	H. E.	Arkansas.	160	Decision local land office favorable to United States; pending General Land Office.
Dolson, Franklin.	H. E.	do.	160	Canceled on default.
Drewes, Lucy J.	H. E.	Ozark.	80	Adverse proceedings dismissed.
Duncan, Wm.	H. E.	Arkansas.	160	Hearing held; pending decision local land office.
Dunkin, Van.	H. E.	do.	160	Adverse proceedings directed; pending local land office.
Duraa, Juan.	Small holding.	Jemez.	160	Adverse report pending General Land Office.
Dushey, J. F.	H. E.	Ozark.	160	General Land Office declined to order adverse proceedings.
Dycus, J. B.	H. E.	Arkansas.	160	Canceled; statutory period expired without proof.
Edenio, Albert.	H. E.	Pecos.	160	Do.
Edenington, John.	H. E.	Alamo.	160	Hearing held; pending decision local land office.
Edwards, A. J.	H. E.	Arkansas.	160	Lands eliminated.
Edgert, Wm. H.	H. E.	do.	160	Adverse proceedings dismissed.
El Paso et al. lodes.	M. A.	Prescott.	140	Hearing held; pending decision local land office.
Emmerson, M. E.	H. E.	Arkansas.	160	Annulled on default.
Emma S. et al. lodes.	M. L.	Wichita.	40	Lands eliminated.
England, Melvin.	H. E.	Ozark.	80	Adverse proceedings directed; pending local land office.
English, G. M.	H. E.	do.	160	Pending report of supervisor.
Erie et al. placers.	M. L.	Pecos.	480	Hearing held; pending decision of local land office.
Eslinger, A. T.	H. E.	Arkansas.	160	

II. E.	do	80	Decision of local land office favorable to United States; pending General Land Office.
Essman, James A.	Tonto and Prescott.	20	Entry canceled after hearing.
Eureka lode.	Arkansas.	160	Entry canceled on default.
Evarista, R.	Gila.	20	Adverse proceedings dismissed.
Fairview lode.	Arkansas.	160	Canceled on default.
Farley, Eric W.	do	160	Adverse report pending General Land Office.
Farrar, John E.	do	160	Canceled after hearing.
Fattig, Pius.	Covinino.	160	Canceled on default.
Findley, S. A.	Ozark.	160	Decision General Land Office favorable to United States; pending before Secretary.
Fish, Mary J. B.	do	160	Decision local land office favorable to United States; pending General Land Office.
Ford, A. L.	Arkansas.	160	Lands eliminated.
Ford, Erasmus.	do	160	Decision local land office favorable to United States; pending General Land Office.
Ford, W. A.	do	160	do
Forehand, H. W.	do	160	Hearing held; pending decision local land office.
Forest, D. T.	do	40	Lands eliminated.
Fractional et al. placer.	Prescott.	50	Canceled on default.
Franklin, John.	Arkansas.	160	Decision local land office favorable to United States; pending General Land Office.
Frazier, S.	Florida.	160	Relinquished before hearing.
Freeman, M. C.	Arkansas.	160	Patent issued.
French, Byron.	do	160	Hearing held; pending decision local land office.
Fritz, S. H.	do	160	do
Gale, John M.	do	160	do
Gallena lode.	Wichita.	20	Adverse proceedings directed; pending local land office.
Ganey, J. A.	Florida.	160	do
Garcia, Daniel.	Alamo.	160	Canceled on default.
Gardner, Frank.	Ozark.	160	Adverse proceedings directed; pending local land office.
Garrison, P. G.	do	80	Lands eliminated.
Garvin, Ann E.	Arkansas.	160	do
Geackino, A.	do	160	Lands eliminated.
Gibbons, Rud.	do	160	General Land Office declined to order adverse proceedings.
Gibbons, Sarah A.	Ozark.	40	Canceled on default.
Gibbons, Wm. H.	Arkansas.	80	Decision local land office favorable to United States; pending General Land Office.
Gibson, M. E.	Ozark.	120	do
Gilleland, G. W.	Alamo.	160	Canceled on default.
Glenn, John A.	Arkansas.	80	do
Godiez, Pietro.	do	160	do
Gonzales, Diego.	Carson.	160	do
Gonzales, Emilio.	Jemez.	160	Adverse proceedings directed; pending local land office.
Gonzales, M. A.	do	160	Adverse report pending General Land Office.
Gonzales, Prudentio.	Pecos.	160	Pending on hearing set.
Gonzales, Reyes.	Jemez.	129	Pending local land office; adverse proceedings directed.
Gonzales, Tomas.	do	120	Canceled on proof showing.
Good, Ella.	do	80	Proof rejected; entry held intact.
Goodwin, J. L.	Arkansas.	160	Relinquished before hearing.
Goosby, Dave.	Florida.	160	Adverse report pending General Land Office.
Gossett, W.	Arkansas.	160	Canceled on default.
Graham, Geo. W.	do	160	Pending on hearing set.
Graym, T. M.	do	160	Canceled on default.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 3—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
			<i>Acres.</i>	
Grieco, Rafael.....	H. E.....	Manzano.....	160	Canceled after hearing.
Gross, H. J.....	H. E.....	Arkansas.....	160	Relinquished before hearing.
Guliat, Horace.....	H. E.....	Ozark.....	160	Canceled on default.
Gunn, W. J. (heir of E. G. Gunn).....	H. E.....	Florida.....	160	Hearing held; pending local land office.
Gunn, W. J., sr.....	H. E.....	do.....	160	Adverse report; pending General Land Office.
Gurule, J. L. A.....	H. E.....	Manzano.....	120	Do.
Hall, H. N.....	T. and S.....	Arkansas.....	160	Canceled on record showing.
Hambriek, Wiley.....	H. E.....	Florida.....	160	Decision local land office adverse to United States; pending General Land Office.
Hamby, W. W.....	H. E.....	Arkansas.....	160	Relinquished before hearing.
Hamline, Clarence.....	H. E.....	do.....	160	Canceled on default.
Hammond, J. A.....	H. E.....	Ozark.....	160	Lands eliminated.
Hampton, R. F.....	H. E.....	Arkansas.....	120	No objection issuance final certificate.
Hancock et al. lodes.....	M. A.....	Prescott.....	200	M. A. rejected; case closed.
Hankus, Jos.....	H. E.....	Arkansas.....	40	Canceled on default.
Hansard, J. L.....	H. E.....	do.....	160	Hearing held; pending decision local land office.
Hare, Wm. A.....	H. E.....	do.....	120	Adverse report; pending General Land Office.
Harmon, Abram.....	H. E.....	do.....	160	Do.
Harmon, Zina.....	H. E.....	do.....	160	Canceled on private contest.
Harold et al. lodes.....	M. A.....	Prescott.....	53	Hearing held; pending decision local land office.
Harrell, Chas.....	H. E.....	Arkansas.....	160	Decision local land office favorable to United States; pending General Land Office.
Harris, Fannie.....	H. E.....	Florida.....	160	Canceled on default.
Harris, W. J.....	H. E.....	Ozark.....	160	Decision local land office favorable to United States; pending General Land Office.
Hart, Anthony.....	H. E.....	do.....	160	Do.
Harvey, J. W.....	H. E.....	Alamo.....	160	Canceled on default.
Hasson, N. F.....	H. E.....	Zuni.....	160	Adverse report; pending General Land Office.
Havens, J. M.....	H. E.....	Alamo.....	160	Canceled on default.
Hattox, Chas. T.....	H. E.....	Chiricahua.....	160	Do.
Hawk, Chas. H.....	H. E.....	Ozark.....	80	Adverse proceedings dismissed.
Hawkins, J. C.....	H. E.....	Arkansas.....	40	Canceled on default.
Hawkins, R. A.....	H. E.....	do.....	160	Proof rejected; entry held intact.
Haynes, J. E.....	H. E.....	do.....	160	Canceled on default.
Haynes, J. E.....	H. E.....	Ozark.....	160	Lands eliminated.
Hayward, F. W.....	H. E.....	do.....	160	Do.
Helen Gould et al. lodes.....	M. A.....	Garces.....	48	Adverse proceedings directed; pending local land office.
Helm, J. W.....	H. E.....	Florida.....	160	Canceled; conflict with National Forest.
Henderson, I. G.....	H. E.....	Ozark.....	80	Lands eliminated.

Hongo, Fred.....	H. E.....	Arkansas.....	160	Canceled on default.
Henry, James.....	H. E.....	Ozark.....	80	Patent issued.
Hensley, J. C.....	T. and S.....	do.....	80	Do.
Hensley, S. N.....	H. E.....	do.....	80	No objection.
Herrera, E.....	H. E.....	Jemez.....	120	Canceled after hearing.
Hess, G. W.....	H. E.....	Ozark.....	160	Canceled on default.
Hester, Emma.....	H. E.....	do.....	40	Do.
Hickman, I. B.....	H. E.....	Arkansas.....	160	Decision local land office favorable to United States; pending General Land Office.
Hill, J. P.....	H. E.....	do.....	160	Canceled on default.
Hill, T. J.....	H. E.....	do.....	160	Hearing held; pending decision local land office.
Hill, Thos. J.....	H. E.....	do.....	80	Lands eliminated.
Hilliard, John.....	M. L.....	Ozark.....	20	Adverse report; pending General Land Office.
Hillside, Ido.....	M. L.....	Coomito.....	80	Hearing held; pending decision local land office.
Hinton, Chas. H.....	H. E.....	Wichita.....	160	Decision local land office favorable to United States; pending General Land Office.
Hise, J. M.....	H. E.....	Arkansas.....	20	Adverse proceedings directed; pending local land office.
Holson, Isaac.....	M. L.....	Prescott.....	160	Canceled on default.
Holland, B. F.....	H. E.....	Arkansas.....	120	Do.
Holland, G. T.....	H. E.....	do.....	80	Adverse proceedings; dismissed.
Hollister, J. W. C.....	H. E.....	Alamo.....	160	Adverse report; pending General Land Office.
Hollmes, Rosa.....	H. E.....	Ozark.....	160	Lands eliminated.
Holtou, Earnest.....	H. E.....	Arkansas.....	160	Relinquished before hearing.
Holmes, W. J.....	H. E.....	Manzano.....	160	Canceled on default.
Hooper, T. P.....	H. E.....	Arkansas.....	160	Lands eliminated.
Hooten, E. S.....	H. E.....	Ozark.....	160	Decision local land office favorable to United States; pending General Land Office.
Howard, H. C.....	H. E.....	Arkansas.....	160	Do.
Hudgins, J. R.....	H. E.....	do.....	160	Do.
Hughes, J. A.....	H. E.....	do.....	160	Adverse report; pending General Land Office.
Hughes, Mary.....	H. E.....	Ozark.....	160	Decision local land office favorable to United States; pending General Land Office.
Hughes, M. (heirs of).....	H. E.....	Datil.....	160	Office.
Hunt, Wm. B.....	H. E.....	Arkansas.....	120	General Land Office declined to order adverse proceedings.
Huntor, H. E.....	H. E.....	do.....	160	Decision local land office favorable to United States; pending General Land Office.
Huntor, M. D.....	H. E.....	do.....	160	Relinquished before hearing.
Hyde, F. A., & Co.....	L. S.....	Gares.....	40	Adverse proceedings directed; pending local land office.
Indinger, J. M.....	H. E.....	Florida.....	160	Canceled after hearing.
Irwin, T. E.....	H. E.....	Apache.....	160	Adverse proceedings directed; pending local land office.
Isaacs, W. P.....	H. E.....	Arkansas.....	160	Canceled; statutory period expired without proof.
Ivy, Ido.....	M. L.....	Lincoln.....	20	Adverse report; pending General Land Office.
Jackson, A. M.....	H. E.....	Arkansas.....	160	Decision local land office favorable to United States; pending General Land Office.
Jackson, Geo. H.....	H. E.....	do.....	160	Canceled on default.
Jackson, J. E.....	H. E.....	do.....	160	Decision local land office favorable to United States; pending General Land Office.
Jackson, J. E.....	H. E.....	do.....	120	Canceled on default.
James, J. L.....	H. E.....	Ozark.....	160	Patent issued.
Jernigan, C. E.....	H. E.....	Florida.....	160	Relinquished before hearing.
Johnson, J. B.....	H. E.....	Arkansas.....	160	Canceled after hearing.
Johnson, John L.....	T. and S.....	do.....	160	Canceled for conflict with National Forest.
Johnson, M. D.....	H. E.....	do.....	160	Do.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 3—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Johnson, T. A.....	H. E.....	Arkansas.....	Acres.	Decision local land office favorable to United States; pending General Land Office.
Johnson, Wm. C.....	H. E.....	Manzano.....	100	Closed; proof rejected; entry held intact.
James A. D.....	H. E.....	Arkansas.....	100	Decision local land office favorable to United States; entry held intact.
James Wm. R.....	H. E.....	Ozark.....	100	Canceled on default.
Jordan, John.....	H. E.....	do.....	40	Lands eliminated.
Kanick et al. lodes.....	M. A.....	Prescott.....	103	Adverse proceedings directed; pending local land office.
Kearney, Robert.....	C. E.....	St. Georges.....	40	Rehearing held after hearing.
Kelcher, T. F., Jr.....	H. E.....	Manzano.....	100	Proof rejected; entry held intact.
Kenip J. G.....	H. E.....	Ozark.....	100	Decision local land office favorable to United States; pending General Land Office.
King, Columbus.....	H. E.....	do.....	160	Rehearing before hearing.
King, Ella.....	H. E.....	Arkansas.....	100	Canceled; statutory period expired.
Kinner Isaac.....	H. E.....	do.....	100	Canceled on default.
Kidner, E. A.....	H. E.....	Ozark.....	100	Entry canceled after hearing.
Kinna, C. F.....	H. E.....	Arkansas.....	100	Pending on hearing set.
Koepke, O. C.....	H. E.....	Ozark.....	100	Canceled on default.
Kowalski, A. P.....	H. E.....	do.....	100	Adverse proceedings directed; pending local land office.
Lair, J. N.....	H. E.....	Arkansas.....	100	Do.
Landrus, I. I.....	H. E.....	do.....	100	Canceled on default.
Lankford, Benj.....	H. E.....	Florida.....	100	No objection issuance of final certificate.
Last Chance place.....	M. L.....	Wichita.....	80	Canceled on default.
Latham, C. L.....	H. E.....	Idaho.....	100	Pending on hearing set.
Lay, H. C.....	H. E.....	Ozark.....	80	Canceled on default.
Leach, J. W.....	H. E.....	Arkansas.....	100	Decision local land office favorable to United States; pending General Land Office.
Lesueur, W. C.....	H. E.....	Apache.....	100	Hearing held; pending decision local land office.
Lewis, H. N.....	H. E.....	Arkansas.....	100	Canceled on default.
Lewis lode.....	M. A.....	Lincoln.....	21	Adverse proceedings directed; pending local land office.
Lindsey, W. J.....	H. E.....	Zuni.....	100	Canceled on default.
Lindsey, A. F.....	T. and S.....	Ozark.....	100	Patent issued.
Lindsey, C. L.....	H. E.....	Arkansas.....	100	Decision of local land office favorable to United States; pending General Land Office.
Lindsey, Cora.....	H. E.....	do.....	120	Canceled on default.
Linley, James.....	H. E.....	do.....	160	Adverse proceedings directed; pending local land office.
Livingston, W. G.....	H. E.....	Ozark.....	100	Decision of local land office favorable to United States; pending General Land Office.
Locke, R. O.....	H. E.....	Manzano.....	100	Lands eliminated.
Logan et al. lodes.....	M. A.....	Prescott.....	206	Adverse proceedings directed; pending local land office.
London, W. R.....	H. E.....	Arkansas.....	160	Hearing held; pending decision of local land office.

Long, A. E. (heir of J. H. King).	H. E.	Lincoln.	160	Lands eliminated.
Lopez, Luis.	H. E.	do.	160	Adverse proceedings dismissed.
Lopez, Timoteo.	H. E.	Manano.	160	Canceled on record showing.
Lowder, G. D.	H. E.	Ozark.	80	Relinquished before hearing.
Luber, John.	H. E.	do.	160	Decision of local land office favorable to United States; pending General Land Office.
Lutz, Iode.	M. L.	Lincoln.	20	Annulled on default.
Lujan, Luciana.	H. E.	Pecos.	160	General Land Office declined to order adverse proceedings.
Lujan, Simon.	H. E.	do.	160	Adverse report pending General Land Office.
Lute, Peter.	H. E.	Ozark.	80	Hearing held; pending decision of local land office.
McBride, J. R.	H. E.	Arkansas.	120	Patent issued.
McCallon, B. M.	H. E.	do.	160	Canceled on default.
McCallum, G. E.	H. E.	Ozark.	160	Do.
McCallum, E.	H. E.	do.	80	No objection to issuance of final certificate.
McCormick, J. E.	H. E.	Arkansas.	160	Proof rejected; entry held intact.
McDaniels, J. D.	H. E.	do.	160	Hearing held; pending decision of local land office.
McGee, William.	H. E.	do.	160	Relinquished before hearing.
McKee, W. G.	H. E.	Ozark.	160	Decision of local land office favorable to United States; pending General Land Office.
McKenzie, D. P.	H. E.	Florida.	160	Decision of local land office favorable to United States; pending before Secretary.
McKinley millsite.	M. L.	Gila.	5	Adverse report; pending General Land Office.
Mark, John.	H. E.	Arkansas.	160	Do.
Mayer, H. F.	H. E.	do.	160	Decision of local land office favorable to United States; pending General Land Office.
Malone, W. C.	H. E.	do.	160	Patent issued.
Mammoth et al. lodes, Arizona Copper Co.	M. A.	Apache.	111	Lands eliminated.
Mammoth et al. lodes, Sierra & Co.	M. L.	do.	114	Do.
Manion, A. J.	H. E.	Ozark.	160	Canceled on default.
Manzaneros, R.	Small holding.	Jemez.	160	Adverse report; pending General Land Office.
Marshall, L. M.	H. E.	Arkansas.	160	Canceled on default.
Martin, J. J.	H. E.	Ozark.	160	Decision of local land office favorable to United States; pending General Land Office.
Martinez, Higinio.	H. E.	Pecos.	160	Do.
Mary Mine et al. lodes.	M. E.	Coronado.	412	Lands eliminated.
Mastern, Burnes.	H. E.	Ozark.	80	Relinquished after default.
Masters, Giles.	H. E.	Zuni.	160	Relinquished before hearing.
Masters, J. C.	H. E.	Arkansas.	160	Canceled on default.
Masters, R. C.	H. E.	Zuni.	160	Relinquished before hearing.
Masterson, S. J.	H. E.	Arkansas.	160	Canceled on default.
Math, Jos.	H. E.	do.	160	Hearing held; pending decision of local land office.
Mattison, Benj. A.	H. E.	Florida.	160	Adverse proceedings dismissed.
May, T. H.	H. E.	Coronado.	160	Relinquished before hearing.
Melick, P. A.	H. E.	Mississippi.	160	Canceled after hearing.
Merrill, G. H.	M. A.	Prescott.	51	Lands eliminated.
Midgee placer.	H. E.	Alamo.	160	Patent issued.
Miler, Leel.	H. E.	Arkansas.	160	Canceled on default; closed.
Miler, Rella.	H. E.	Ozark.	160	Proof rejected; entry held intact.
Millaps, C. A.	H. E.	Lincoln.	160	Adverse report; pending General Land Office.
Monarch lode.	M. L.			

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—(Continued.)

DISTRICT NO. 3—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Monroe Doctrine et al. lodes.	M. A.	Crook.	<i>Acres.</i> 41	Decision of local land office favorable to United States; pending General Land Office.
Moore, Mark.	H. E.	Arkansas.	100	Adverse report; pending General Land Office.
Mott, C. A.	H. E.	do.	100	Relinquished before hearing.
Mountain View lode.	M. E.	Prescott.	18	Canceled after hearing.
Murphy, Wm.	H. E.	Arkansas.	100	Adverse proceedings directed; pending local land office.
Murray, J. S.	H. E.	Ozark.	100	Lands eliminated.
Myrtle lode.	M. L.	Crook.	18	Adverse proceedings dismissed.
Naylor, Chas.	H. E.	Arkansas.	100	Canceled on default.
Neal, J. A. J.	H. E.	do.	100	Do.
Neal, John R.	H. E.	do.	100	Do.
Nichols, I. W.	H. E.	do.	100	Hearing held; pending decision of local land office.
Nigra, Paula.	H. E.	do.	100	Canceled on default.
Nix, W. O.	H. E.	do.	100	Hearing held; pending decision of local land office.
Nixon, D. M.	H. E.	Ozark.	80	Relinquished before hearing.
Noddings, Jos.	H. E.	Arkansas.	40	Canceled on default.
Nopper, Bertha.	H. E.	do.	100	Adverse report; pending General Land Office.
Notick, J. W.	H. E.	Ozark.	100	Adverse proceedings dismissed.
O'Brien, B. M.	H. E.	Alamo.	100	No objection to issuance of final certificate.
Olden, M. E.	H. E.	do.	100	Do.
Oldham, J. H.	H. E.	Arkansas.	100	Canceled on default.
Oliver, W. L.	H. E.	do.	100	Do.
Oram, R. J.	H. E.	Ozark.	100	Canceled on record showing.
Orndorff, Eva.	H. E.	do.	40	Relinquished before hearing.
Ortiz, Casimiro.	H. E.	Pecos.	100	Hearing held; pending decision of local land office.
Otero, Federico.	H. E.	Manzano.	40	Adverse report; pending General Land Office.
Owens, W. J.	H. E.	Arkansas.	100	Hearing held; pending decision of local land office.
Parker, J. M.	H. E.	Florida.	100	Do.
Parkey, John.	H. E.	Arkansas.	100	Canceled on default.
Parsons, J. F.	H. E.	Ozark.	100	Decision of local land office favorable to United States; pending General Land Office.
Patterson, J. L.	H. E.	Tonto.	100	Adverse proceedings dismissed.
Penrod, D. H.	H. E.	Sitgreaves.	100	Relinquished before hearing.
Peoria et al. placers.	M. E.	Prescott.	20	Adverse proceedings directed; pending local land office.
Perretto, L.	H. E.	Arkansas.	100	Lands eliminated.
Pettit, S. J.	H. E.	do.	100	Decision of local land office favorable to United States; pending General Land Office.
Phaup, B. R.	T. and S.	do.	100	Patented; proceedings to vacate being considered.
Pierce, Jesse W.	H. E.	do.	100	Closed; canceled on default.
Pinkerton, L. C.	H. E.	do.	100	Decision of local land office favorable to United States; pending General Land Office.

Plain, J. S.....	H. E.....	Alamo.....	160	Relinquished before hearing.
Poindexter, R. L.....	H. E.....	Arkansas.....	160	Canceled on default.
Pool, Lou O.....	T. and S.....	do.....	160	Patent issued.
Poston, Geo.....	H. E.....	do.....	120	Decision of local land office favorable to United States; pending General Land Office.
Powers, A. J.....	H. E.....	do.....	160	Hearing held; pending decision of local land office.
Quinn, Thos. A.....	H. E.....	do.....	120	Canceled on default.
Rauskale, W. M.....	H. E.....	Ozark.....	80	Adverse report; pending General Land Office.
Raiford, Wm. B.....	H. E.....	Arkansas.....	160	General Land Office declined to order adverse proceedings.
Rankin, Burros.....	H. E.....	Ozark.....	160	Canceled on default.
Rankin, Columbus.....	H. E.....	do.....	160	Do.
Ray, Mary.....	H. E.....	Arkansas.....	80	Decision of local land office favorable to United States; pending General Land Office.
Reed, J. A.....	H. E.....	do.....	160	Canceled after hearing.
Reddick, Josephine.....	H. E.....	Prescott.....	160	Lands eliminated.
Rice, Lee.....	H. E.....	Gila.....	160	Relinquished before hearing.
Riener, G. C.....	H. E.....	Arkansas.....	160	Lands eliminated.
Rosch, E. L.....	H. E.....	do.....	160	Lands eliminated.
Robinson, J. R.....	H. E.....	Ozark.....	160	Adverse proceedings dismissed.
Robels, G.....	H. E.....	Lincoln.....	160	No objection to issuance of final certificate.
Rodgers, R. E. L.....	H. E.....	Ozark.....	160	Lands eliminated.
Rodriguez, I.....	H. E.....	Datil.....	160	Canceled on default.
Roope, L. A.....	H. E.....	Arkansas.....	160	Decision of local land office favorable to United States; pending General Land Office.
Rose, J. J.....	H. E.....	Ozark.....	160	Lands eliminated.
Ross, John.....	H. E.....	do.....	160	Canceled on default.
Rowland, M. E.....	H. E.....	do.....	160	Pending on hearing set.
Roybal, J.....	H. E.....	Pecos.....	160	Adverse report; pending General Land Office.
Saffell, C. G.....	H. E.....	Apache.....	160	Decision of local land office favorable to United States; pending before Secretary.
Salem lode.....	M. L.....	Prescott.....	20	Adverse proceedings dismissed.
Sandoval, Pedro.....	H. E.....	Manzano.....	160	Decision of local land office favorable to United States; pending General Land Office.
Sanford, W. H.....	H. E.....	Arkansas.....	160	Hearing held; pending decision of local land office.
Santmeyer, A. F.....	H. E.....	do.....	160	Decision of local land office favorable to United States; pending General Land Office.
Scarborough, J. W.....	H. E.....	do.....	80	Patent issued.
Schofield, W. P.....	H. E.....	do.....	80	Canceled on default.
Self, Wm. L.....	H. E.....	do.....	160	Lands eliminated.
Sellers, D. H.....	H. E.....	do.....	150	Adverse proceedings directed; pending local land office.
Seymour, E. M.....	H. E.....	do.....	160	Canceled on default.
Shaddon, J. T.....	H. E.....	do.....	160	Hearing held; pending decision of local land office.
Shatswell, Geo.....	H. E.....	Ozark.....	160	Lands eliminated.
Shatswell, Joe.....	H. E.....	do.....	160	Do.
Shatswell, Wm. A.....	H. E.....	do.....	160	Do.
Shelley, Janie.....	H. E.....	do.....	160	Relinquished before hearing.
Shelley, Jos. A.....	H. E.....	Florida.....	160	Pending report of supervisor.
Sherridan, Leona.....	H. E.....	do.....	160	Adverse proceedings directed; pending local land office.
Shipman, J. F.....	H. E.....	Ozark.....	160	Lands eliminated.
Shore, Wm. A.....	H. E.....	Arkansas.....	160	Do.
Shores, J. T.....	H. E.....	do.....	160	No objection.
Simis, Isaac.....	H. E.....	do.....	160	Proof rejected; entry held intact.
		do.....	160	Decision of Secretary favorable to United States.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 3—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
			<i>Acres.</i>	
Singleton, G. D.	H. E.	Arkansas.	120	Lands eliminated.
Singleton, Wm. C.	H. E.	do.	160	Adverse proceedings directed; pending local land office.
Slater, Irwin.	H. E.	do.	160	No objection to issuance of final certificate.
Slusser, Wm. M.	H. E.	do.	80	Canceled on default.
Smith, Henry.	H. E.	do.	160	Do.
Smith, Jas. J.	H. E.	do.	160	Adverse report; pending General Land Office.
Smith, John W.	H. E.	do.	160	Relinquished before hearing.
Smith, Mollie.	H. E.	Ozark.	160	Lands eliminated.
Smith, R. H.	H. E.	do.	40	Do.
Snow, Jos. E.	H. E.	do.	160	Adverse proceedings dismissed.
Snow, Polly.	H. E.	do.	160	Lands eliminated.
Snow, Rebecca.	H. E.	do.	160	Decision of local land office favorable to United States; pending General Land Office.
Sorell, A. M.	H. E.	Alamo.	160	Canceled on default.
Speights, Mahala.	H. E.	Arkansas.	80	Adverse report; pending General Land Office.
Spencer, H. W.	H. E.	do.	160	General Land Office declined to order adverse proceedings.
Spencer, J. W.	H. E.	do.	160	Canceled on default.
Spencer, John, sr.	H. E.	Ozark.	160	Do.
Spiva, Jonas L.	H. E.	Arkansas.	120	Adverse report; pending General Land Office.
Stacks, J. N.	H. E.	do.	160	Canceled on default.
Steele, H. J.	H. E.	Ozark.	80	Do.
Stephens, A.	H. E.	do.	160	Decision of local land office favorable to United States; pending General Land Office.
Sterling, W. E.	H. E.	do.	160	Lands eliminated.
Stevens, Joel W.	H. E.	Arkansas.	160	Canceled on default.
Stewart, J. H.	H. E.	Ozark.	160	Decision of local land office adverse to United States; pending General Land Office.
Stewart, J. L.	H. E.	Arkansas.	160	Decision of local land office favorable to United States; pending General Land Office.
Stewart, J. W.	H. E.	do.	160	Canceled on default.
Stiles, F.	H. E.	do.	160	Relinquished before hearing.
Stivers, Mrs. M. J.	H. E.	Ozark.	160	Lands eliminated.
Stormes, J. B.	H. E.	Arkansas.	160	Decision of local land office favorable to United States; pending General Land Office.
Stover, J. L.	H. E.	do.	80	No objection to issuance of final certificate.
Strain, Jos. H.	H. E.	Ozark.	160	Adverse proceedings directed; pending local land office.
Strayhorn, T. B.	H. E.	Arkansas.	160	No objection to issuance of final certificate.
Sturgeon, J. A.	H. E.	do.	160	Decision of local land office favorable to United States; pending General Land Office.
Swider, S. S.	H. E.	do.	160	Canceled on default.
Swiney, R. D.	H. E.	Florida.	160	Adverse proceedings directed; pending local land office.

Tanner, S.	H. E.	Ozark.	160	Canceled on default.
Tate, R. H.	H. E.	do.	160	Hearing held; pending decision local land office.
Taylor, Elizabeth.	H. E.	do.	160	Decision of local land office favorable to United States; pending General Land Office.
Tennessee lode.	M. E.	Wichita.	20	Do.
Terry, C. J.	H. E.	Manzano.	160	Relinquished before hearing.
Thompson, T. E.	H. E.	Ozark.	160	Adverse report; pending General Land Office.
Thompson, J. J.	H. E.	Arkansas.	40	Canceled on default.
Thillery, Jennie.	H. E.	do.	160	Decision of local land office favorable to United States; pending before Secretary.
Thillery, Noah.	H. E.	Ozark.	160	Canceled on default.
Thillery, S. T.	H. E.	Arkansas.	120	Do.
Todd, John.	H. E.	do.	160	Remanded to local land office; there pending.
Tolliver, J. F.	H. E.	Ozark.	160	Canceled on default.
Trainer, H. P.	H. E.	Apache.	160	Hearing held; pending decision local land office.
Trask, L.	H. E.	Coronado.	160	Adverse proceedings dismissed.
Trujillo, R.	H. E.	Carson.	160	No objection to issuance of final certificate.
Trujillo Y. Taloya, D.	H. E.	Manzano.	160	Do.
Turner, Jas.	H. E.	Arkansas.	160	Lands eliminated.
Turkey lode.	M. L.	Prescott.	20	Adverse report; pending General Land Office.
Tuttle, C. W.	H. E.	Ozark.	160	Adverse proceedings dismissed.
Unlimited No. 3 lode.	M. E.	Do.	20	Do.
Valley et al. lodes.	M. L.	Chiricahua.	52	Do.
Vanslyke, J. M.	T. and S.	Arkansas.	160	No objection to issuance of final certificate.
Vaughn, E.	H. E.	Alamo.	160	Canceled after hearing.
Velasquez, Vidal.	H. E.	Jemez.	160	Do.
Verbridge, J.	H. E.	Ozark.	160	Adverse proceedings directed; pending General Land Office.
Wamgo lode.	M. L.	Gila.	20	Adverse report; pending General Land Office.
Ward, F. S.	H. E.	Ozark.	120	Relinquished before hearing.
Ware, H. J.	H. E.	Arkansas.	160	Adverse report; pending General Land Office.
Warneck, Carl.	H. E.	Lincoln.	160	Canceled on default.
Warren, C. W.	H. E.	Arkansas.	160	No objection to issuance of final certificate.
Warren, Oliver.	H. E.	Ozark.	80	Adverse proceedings directed; pending local land office.
Waterman, L. P.	H. E.	Florida.	40	Do.
Watkins, S. T.	H. E.	Chiricahua.	160	Adverse report; pending General Land Office.
Watson, W. H.	H. E.	Ozark.	160	Decision of local land office favorable to United States; pending General Land Office.
Watson, W. C.	H. E.	Alamo.	160	Adverse proceedings dismissed.
Watts, W. H.	H. E.	Arkansas.	160	Canceled on default.
Webb, E. H.	H. E.	do.	160	Hearing held; pending decision of local land office.
Weber, Frank.	H. E.	Coronado.	160	Patent issued.
Weekley, C. L.	H. E.	Florida.	160	Adverse proceedings directed; pending local land office.
Weekley, F. F.	H. E.	do.	160	No objection to issuance of final certificate.
Weekley, M. E.	H. E.	do.	160	Pending report of supervisor.
Weekley, M. V.	H. E.	do.	160	Do.
Weekley, N. E.	H. E.	do.	160	Adverse proceedings dismissed.
Weekley, W. E.	H. E.	do.	160	Adverse proceedings directed; pending local land office.
Weir, E. E.	H. E.	Arkansas.	160	Canceled on default.
Werner, E. E.	H. E.	do.	160	Do.
Westland, E. T.	H. E.	do.	160	Hearing held; pending decision of local land office.
Whitaker, B. F.	H. E.	Manzano.	160	Canceled on default.
Whitcamp, T. H.	H. E.	Arkansas.	80	Adverse report; pending General Land Office.
White, E. N.	H. E.	Alamo.	160	Canceled on default.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 3—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
White, G. W.	H. E.	Lincoln.	<i>Acres.</i> 100	Canceled on default
White, Harry.	H. E.	Florida.	100	Do.
Whitner, C. V.	T. and S.	Arkansas.	100	Hearing held; pending decision of local land office.
Whitner, H. S.	T. and S.	do.	100	Do.
Whitner, J. D.	T. and S.	do.	100	Do.
Whitner, F.	H. E.	do.	100	Do.
Wick, H.	H. E.	do.	100	Relinquished before hearing.
Wiles, I. H.	H. E.	do.	100	No objection to issuance of final certificate.
Wilkinson, J. R.	H. E.	do.	100	Pending on hearing set.
Willcutt, S. O.	H. E.	do.	100	Canceled on default.
Williams, O. P.	H. E.	Ozark.	80	Adverse report; pending General Land Office.
Williams, S. F.	H. E.	do.	40	Lands eliminated.
Wilton, Chas.	H. E.	do.	100	Canceled on default.
Woolley, Ida.	H. E.	Arkansas.	100	Do.
Woolley, J. T.	H. E.	do.	80	Do.
Wyatt, A. M.	H. E.	do.	100	Decision of local land office favorable to United States; pending General Land Office.
Wynn, Wm. T.	H. E.	do.	100	Pending report of supervisor.
York, H. H.	H. E.	Ozark.	100	Adverse report; pending General Land Office.
Yosemite et al. Iodes.	M. E.	Gardes.	25	Do.
Young, Florence.	H. E.	Arkansas.	100	Hearing held; pending decision of local land office.
Zabloski, B. G.	H. E.	Ozark.	100	Adverse proceedings directed; pending local land office.

DISTRICT NO. 4.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Seigel Consolidated Mining Co.	M. E.	Nevada.	<i>Acres.</i> 21	Adverse report to General Land Office.
Manhattan Sunshine Mining Co.	M. E.	Toiyabe.	19	Do.
Walter A. Kilgore.	D. L. E.	Teton.	120	Do.
Manhattan Lucky Boy Mining Co.	M. E.	Toiyabe.	35	Do.
Kennebec Mining Co.	M. E.	Wasatch.	65	Do.
Roy H. White.	H. E.	Boise.	100	Do.
William J. Swapp.	H. E.	Sevier.	100	Adverse proceedings directed.
State of Utah.	S. S.	Wanti.	750	Do.
Mountain Lake Mining Co.	M. E.	Wasatch.	20	Do.
Jarbridge Hilltop Co.	M. E.	Humboldt.	90	Do.

A. E. Anderson.....	H. E.	Payette.....	160	Do.
C. W. Clark.....	L. S.	Humboldt.....	40	Do.
Do.....	L. S.	do.....	40	Do.
F. A. Hyde & Co.....	L. S.	Sierra.....	880	Do.
Do.....	L. S.	Mindoka.....	80	Do.
Do.....	L. S.	Boise.....	200	Do.
Do.....	L. S.	do.....	440	Do.
Do.....	L. S.	Mindoka.....	120	Do.
Do.....	L. S.	Humboldt.....	40	Do.
Do.....	L. S.	Sierra.....	40	Do.
Do.....	L. S.	Ia Sal.....	160	Do.
Do.....	L. S.	Sierra.....	400	Do.
Do.....	L. S.	Wasatch.....	40	Do.
Utah State Board of Land Commissioners.....	S. S.	do.....	400	Do.
C. W. Clark.....	L. S.	Humboldt.....	40	Do.
Do.....	L. S.	do.....	40	Do.
F. A. Hyde & Co.....	L. S.	Mindoka.....	80	Do.
Mineral Flat Mining Co.....	M. E.	Wasatch.....	211	At issue.
Great Western Gold & Cop- per Co.....	M. E.	do.....	120	Do.
Idaho Mining & Lumber Co.....	M. E.	Salmon.....	185	Do.
Gold Development Co. of Utah.....	M. E.	Filmore.....	272	Do.
Outzen Mining Co.....	M. E.	do.....	145	Do.
Job G. Turner.....	H. E.	Weiser.....	160	Do.
Charles Lammersdorf.....	M. E.	Filmore.....	60	Register and receiver's decision adverse to claimant; appeal pending.
Claud M. Freed et al.....	C. E.	Manti.....	2,800	Register and receiver's decision adverse to Government; appeal pending.
Manhattan, Crescent, Eureka Co.....	M. E.	Toiyabe.....	14	Register and receiver's decision adverse to claimant; appeal pending.
Mary Ellen Mining Co.....	M. E.	Wasatch.....	50	Do.
State of Idaho.....	S. S.	Boise.....	40	Do.
Frank J. Pomeroy.....	H. E.	Wyoming.....	160	Do.
Walter Rogers.....	D. L. E.	Targhee.....	320	Do.
Manhattan Gold Mining Co.....	M. E.	Toiyabe.....	19	Hearing had before register and receiver; decision not rendered.
Armour Thompson.....	D. L. E.	Teton.....	40	Do.
George L. Zimmerman.....	H. E.	Payette.....	160	Do.
Auto Hill National Manufac- turing Co.....	M. E.	Santa Rosa.....	20	Register and receiver's decision adverse to Government; appealed to com- missioner.
M. I. Fowler.....	M. E.	Ia Sal.....	20	Do.
Samuel Morgan.....	H. E.	Gache.....	160	Hearing held; awaiting decision of register and receiver.
F. W. Mugner.....	H. E.	Payette.....	160	Do.
State of Idaho.....	S. S.	Boise.....	640	Canceled by commissioner; appealed to Secretary of the Interior.
Do.....	S. S.	do.....	560	Do.
Do.....	S. S.	do.....	320	Do.
Do.....	S. S.	do.....	640	Do.
Do.....	S. S.	do.....	160	Do.
George Morrel.....	H. E.	Fishlake.....	40	Service of charges made.
James A. Collins.....	D. L. E.	Targhee.....	40	At issue.
Starlight Group.....	M. E.	Sawtooth.....	20	Do.
Siegel Consolidated Mining Co.....	M. E.	Nevada.....	20	Do.
Cyrus Bowman.....	H. E.	Wyoming.....	160	Entry canceled.
Dana Gold Mining & Mill- ing Co.....	M. E.	Mindoka.....	27	Proceedings dismissed.

Canceled by register and receiver; pending appeal.

Additional report requested.

At issue.

Register and receiver's decision adverse to claimant; appeal pending.
Register and receiver's decision adverse to Government; appeal pending.
Register and receiver's decision adverse to claimant; appeal pending.Register and receiver's decision adverse to Government; appealed to com-
missioner.

Hearing held; awaiting decision of register and receiver.

Canceled by commissioner; appealed to Secretary of the Interior.

Service of charges made.

Entry canceled.
Proceedings dismissed.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 4—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
<i>A cres.</i>				
Arden C. Biggerstaff.	H. E.	Boise.	160	Entry canceled.
Susannah Campbell.	H. E.	Pocatello.	120	Do.
Caroline Rogers.	D. L. E.	Targhee.	311	Do.
H. B. Curtis.	D. L. E.	Do.	280	Do.
Cyrus Bowman.	D. L. E.	Wyoming.	40	Do.
Thomas Lane.	M. E.	Boise.	531	Application finally rejected.
S. E. Hyman.	H. E.	CACHE.	100	Entry canceled by relinquishment.
William Romjue.	M. E.	Salmon.	160	Entry canceled.
Mertie R. Banks.	H. E.	Payette.	160	Secretary of the Interior rejects commutation proof; held intact.
W. F. King et al.	M. E.	Teton.	160	Entry canceled.
Minnie F. Holden.	H. E.	Wyoming.	160	Do.
Guy J. Giffen.	M. E.	Tolyabe.	20	Do.
W. B. Noland.	H. E.	Weiser.	40	Do.
Mineral Apex Mining Co.	M. E.	Fillmore.	14	Do.
John H. Campbell.	H. E.	Pocatello.	160	Do.
James L. Higley.	H. E.	Manti.	160	Do.
Minnie F. Holden.	D. L. E.	Wyoming.	232	Certificate issued.
Golden Treasure et al.	M. E.	Boise.	19	Entry canceled.
George F. Goodwin.	M. E.	Wasatch.	19	Do.
Arthur O. Huntley.	H. E.	Weiser.	19	Charge withdrawn.
Gold Development Co.	M. E.	Fillmore.	20	Charges withdrawn by Government.
Old Evergreen.	M. E.	Wasatch.	20	Entry canceled.
Anthony Mining Co.	M. S.	Powell.	5	Entry canceled by relinquishment.
Alexander Sims.	H. E.	CACHE.	80	Entry canceled.
Daniel Vessels.	H. E.	Salmon.	160	Do.
J. M. Smith.	H. E.	Weiser.	80	Do.
DISTRICT NO. 5.				
Acme No. 3 Placer Mine (H. J. Langhorst).	M. E.	Plumas.	160	Hearing held; pending decision.
Ajex placer (La Grange Welter & Power Co.).	M. E.	Stanislaus.	45	Adverse report sent General Land Office.
Akron placer (W. A. La Point).	M. E.	Plumas.	160	Adverse proceedings directed by General Land Office.
Albrecht, F. C.	H. E.	Cleveland.	160	Do.
Alder Swamp Mining Claim (Charles Green).	M. E.	Plumas.	40	Decision register and receiver in favor Government.
Alpine placer (Loyal W. Williams).	M. E.	Santa Barbara.	160	Decision register and receiver in favor claimant.

Ambrose, W. L.	Squatter.	Trinity.	160	Adverse report sent General Land Office.
American placer (Columbia Channel Gold Mining Co.)	M. E.	Tahoe.	160	Hearing held; pending decision.
Andreess, Andrew.	H. E.	Stanislaus.	160	Adverse proceedings directed by General Land Office.
Antram, C. C.	M. E.	Tahoe.	80	Do.
Asher, Robert A.	H. E.	Cleveland.	160	Adverse report sent General Land Office.
Avila, Elena.	H. E.	Monterey.	160	Register and receiver recommended entry be canceled; no hearing held.
Beatty placer (H. N. Brown et al.)	M. E.	Plumas.	40	Decision of register and receiver in favor claimant.
Barnes, Ida.	H. E.	Modoc.	160	Adverse report sent General Land Office.
Bell, Richard.	H. E.	California.	160	Do.
Bickel, Charles L.	H. E.	Sequoia.	160	Hearing held; pending decision.
Blair, Matthew E.	H. E.	Eldorado.	160	Decision of register and receiver in favor claimant.
Blue Gravel Consolidated placer (Metcalfe, Wm.)	M. E.	Plumas.	560	Hearing held; pending decision.
Bonetti, Henry.	H. E.	Eldorado.	160	Pending in General Land Office.
Borland, Alexander.	L. S.	Sequoia.	80	Adverse proceedings directed by General Land Office.
Do.	L. S.	do.	40	Do.
Do.	L. S.	do.	40	Do.
Do.	L. S.	do.	40	Do.
Brackett, Leroy B.	H. E.	Shasta.	160	Hearing held; pending decision.
Brady, Margaret.	H. E.	Stanislaus.	160	Pending in General Land Office.
Brady, Mary T.	H. E.	do.	160	Hearing held; pending decision.
Bush, Walter N.	L. S.	Sequoia.	80	Adverse proceedings directed by General Land Office.
Caminetti, L. D.	H. E.	Eldorado.	160	Hearing held; pending additional testimony.
Campbell, William.	H. E.	Plumas.	160	Hearing held; pending decision.
Campbell, Charles.	H. E.	Tahoe.	160	Do.
Canton Mining Co.	M. E.	Plumas.	365. 75	Do.
Cecelia placer (Clark, C. W.)	M. E.	do.	120	Proceedings directed by General Land Office.
Central Pacific Ry. Co.	R. R. sec.	Tahoe.	640	Pending hearing on mineral character.
Cleopatra Group.	M. E.	Klamath.	491. 69	Pending hearing.
Colvin Gulch placer (Harry L. Miller.	M. E.	Trinity.	63. 76	Adverse report sent forester.
Corduroy placer (A. R. Bidwell).	M. E.	Plumas.	160	Adverse proceedings directed by General Land Office.
Clark, C. W.	L. S.	Sierra.	80	Do.
Do.	L. S.	Lassen.	120	Do.
Do.	L. S.	Santa Barbara.	80	Do.
Do.	L. S.	Lassen.	160	Do.
Do.	L. S.	Plumas.	40	Do.
Clover placers (F. S. Chabournac).	M. E.	do.	2,080	Pending in General Land Office.
Clark, C. W.	L. S.	do.	80	Adverse proceedings directed by General Land Office.
Do.	L. S.	Stanislaus.	40	Pending in General Land Office.
Do.	L. S.	Eldorado.	160	Adverse proceedings directed by General Land Office.
Do.	L. S.	Plumas.	40	Pending in General Land Office.
Do.	L. S.	Santa Barbara.	80	Adverse proceedings under amended charges.
Do.	L. S.	do.	80	Do.
Do.	L. S.	Shasta.	560	Pending in General Land Office.
Do.	L. S.	Plumas.	120	Do.
Do.	L. S.	Tahoe.	40	Do.
Do.	L. S.	Plumas.	40	Adverse proceedings directed by General Land Office.
Do.	L. S.	Inyo.	40	Do.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 5—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Clark, C. W.	L. S.	Plumas	<i>Acres.</i> 200	Adverse proceedings directed by General Land Office.
Do.	L. S.	Modoc	40	Do.
Collins, Peter M.	L. S.	Sequoia	120	Pending in General Land Office.
Do.	L. S.	Sierra	120	Do.
Do.	L. S.	Cleveland	80	Do.
Crane, W. L.	Squatter.	Trinity	100	Adverse report sent General Land Office.
Daniels, Walter L.	H. E.	Plumas	160	Decision register and receiver in favor of Government.
Dan. Patch placer (Robt. S. Brown).	M. E.	do.	100	Hearing held; pending decision.
Darlington, Abe.	H. E.	Eldorado	160	Do.
Darlington, Sarah.	H. E.	do.	160	Decision register and receiver in favor of Government.
Don Good, Blowout, and Never Sweat Lodes (McCain, Chris & John).	M. E.	Cleveland	20	Adverse report sent General Land Office.
Eades, William A.	H. E.	Modoc	160	Do.
Edgert, J. W., and Weyl, E.	M. E.	Plumas	320	Adverse proceedings directed by General Land Office.
Elizabeth Consolidated gold mine (J. M. Little).	M. E.	do.	107.05	Hearing held; pending decision.
Elliot, Myrtle J.	H. E.	California	160	Decision register and receiver in favor claimant.
Eversall, William.	H. E.	Sierra	120	Adverse proceedings directed by General Land Office.
Excelsior placer (H. V. Gates).	M. E.	Trinity	220	Decision of commissioner in favor of Government.
Farrington, Wm. J.	D. L. E.	Mono.	280	Hearing held; pending decision.
Fearon, C. T.	H. E.	Monterey	160	Decision register and receiver in favor of Government.
Fease, Jesse H.	H. E.	Trinity	160	Hearing held; pending decision.
Finnegan, Francis.	H. E.	Tahoe	77.95	Adverse proceedings directed by General Land Office.
Forgett, Felix R. O.	H. E.	Stanislaus	80	Decision register and receiver in favor of Government.
Foster, F. C.	H. E.	Klamath	160	Adverse proceedings directed by General Land Office.
Fusler, Mabel.	H. E.	Trinity	160	Adverse report sent General Land Office.
Gus, Gabriele.	H. E.	Monterey	160	Adverse proceedings directed by General Land Office.
Glover, C. E.	L. S.	Shasta	80	Do.
Goldberg, Jacob.	L. S.	do.	120	Do.
Do.	L. S.	do.	40	Do.
Gosdill, William G.	L. S.	do.	640	Do.
Do.	L. S.	Santa Barbara	640	Pending in General Land Office.
Granless, John D.	L. S.	Lassen	160	Decision of register and receiver in favor of Government.
Greenhorn Flat placer (Beaudry, Fred).	M. E.	Eldorado	1,070	Do.
Greenhorn Flat placer (Beaudry, Fred).	M. E.	Trinity	160	Adverse proceeding directed by General Land Office.
Grenenger, Henry J.	H. E.	Eldorado	160	Pending in General Land Office.
Halsted No. 12 mining location (Northern California Mining Co.).	M. E.	Plumas	120	Adverse proceeding directed by General Land Office.
Harrell, A. J.	L. S.	Sequoia	640	Pending in General Land Office; coal report required.

Harris, Jacob A.....	H. E.	Modoc.....	100	Adverse proceedings directed by General Land Office.
Hazel placer (W. J. Clinch).....	M. E.	Plumas.....	160	Pending in General Land Office.
Healey, Julia E.....	H. E.	Trinity.....	160	Do.
Heap, Kachum et al. placers.....	M. E.	Kern.....	20	Decision register and receiver in favor of Government.
(Gibson, Chas. E.).				
High Channel placers (Oro Water, Light & Power Co.).	M. E.	Plumas.....	880	Decision register and receiver partly in favor of Government and partly in favor of claimant.
High Point placer (Florin Le May).....	M. E.	Klamath.....	39. 07	Adverse report sent General Land Office.
Hoskins, Samuel.....	H. E.	Modoc.....	160	Hearing held; pending decision.
House, John.....	H. E.	Cleveland.....	80	Adverse report sent General Land Office.
Hyde, F. A., & Co.....	L. S.	Shasta.....	40	Adverse proceedings directed by General Land Office.
Do.....	L. S.	Santa Barbara.....	80	Do.
Do.....	L. S.	Eldorado.....	160	Do.
Do.....	L. S.	Plumas.....	400	Do.
Do.....	L. S.	Sierra.....	80	Do.
Do.....	L. S.	do.....	40	Do.
Do.....	L. S.	do.....	640	Do.
Do.....	L. S.	Santa Barbara.....	280	Do.
Do.....	L. S.	Sierra.....	40	Do.
Do.....	L. S.	do.....	160	Pending in General Land Office.
Do.....	L. S.	Santa Barbara.....	160	Adverse proceedings directed by General Land Office.
Do.....	L. S.	Sierra.....	80	Pending in General Land Office.
Do.....	L. S.	Plumas.....	580	Do.
Island Hill consolidated Placer.....	M. E.			
Jasper, Mrs. Harriett.....	H. E.	Santa Barbara.....	160	Decision register and receiver in favor of Government.
Jean, John H.....	H. E.	Trinity.....	40	Adverse proceedings directed by General Land Office.
Johnson, Herman M.....	H. E.	Angeles.....	120	Hearing ordered by General Land Office.
Kern, John E.....	H. E.	Tahoe.....	160	Decision of register and receiver in favor of Government.
Kittredge, E. H.....	L. S.	Eldorado.....	80	Pending in General Land Office.
Ledgerwood, J. M.....	Squatter.....	Trinity.....	160	Adverse report sent General Land Office.
Ledgerwood, Thos. O.....	Squatter.....	do.....	160	Do.
Ledgerwood, William.....	Squatter.....	do.....	160	Do.
Ledgerwood, W. R.....	Squatter.....	do.....	160	Do.
Licking placer (W. T. Forson).....	M. E.	Plumas.....	160	Adverse proceedings directed by General Land Office.
Little, E. M.....	H. E.	Stanislaus.....	160	Hearing held; pending decision.
McBride, Archie.....	H. E.	Trinity.....	160	Favorable report sent General Land Office.
McCarthy, Thos. E.....	H. E.	Eldorado.....	160	Pending in General Land Office.
Madrell, James.....	H. E.	Plumas.....	160	Do.
Manhattan Gold Mining Co.....	M. E.	Trinity.....	450	Adverse proceedings ordered by General Land Office.
Mann, Mary E.....	H. E.	Plumas.....	160	Hearing held; pending decision.
Martin, Frank.....	H. E.	Stanislaus.....	160	Decision register and receiver in favor of claimant.
Martin, Walter.....	H. E.	Monterey.....	160	Hearing held; pending decision.
Mason, Commodore P.....	H. E.	Eldorado.....	160	Referred to Attorney General.
Mason, Palmer S.....	H. E.	California.....	160	Do.
Mattly, Frederick D.....	D. L. E.	do.....	160	Pending in General Land Office.
Do.....	H. E.	Mono.....	160	Adverse proceedings directed by General Land Office.
Do.....	H. E.	do.....	160	Do.
Mattly, Mrs. Hannah S.....	H. E.	do.....	160	Decision register and receiver in favor of Government.
Mayfield, Lora L.....	H. E.	California.....	160	Adverse proceedings directed by General Land Office.
Mec, Chesler.....	H. E.	Modoc.....	160	Adverse report sent General Land Office.
Morton placer and Mount Washington quartz (J. A. Smith).....	M. E.	Plumas.....	160	

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Mountain, Howard.....	H. E.....	Eldorado.....	<i>Acres.</i> 160	Hearing held; pending decision.
Mountain Meadows consolidated copper mine.	M. E.....	Lassen.....	206.4	Do.
Murphy, Henry.....	H. E.....	Sequoia.....	160	Do.
Nelson, W. J.....	H. E.....	Stanislaus.....	160	Pending hearing.
Nicholas, Scraphin.....	H. E.....	Angels.....	160	Do.
Northern Headlight Mining & Milling Co.....	M. E.....	Shasta.....	67.83	Decision register and receiver in favor of claimant.
Owen, Joseph.....	H. E.....	Eldorado.....	160	Hearing held; pending decision.
Packard, Otto B.....	H. E.....	do.....	160	Do.
Pallow, Jas. H.....	T. and S.....	Lassen.....	160	Hearing ordered by General Land Office.
Popular Grove placer (G. H. Wolters).....	M. E.....	Plumas.....	160	Adverse proceedings directed by General Land Office.
Potts, William.....	H. E.....	Eldorado.....	160	Decision register and receiver in favor of Government.
Precher, Samuel D.....	M. E.....	Shasta.....	45.63	Hearing held; pending decision.
Raffetta, Frank.....	H. E.....	Eldorado.....	160	Decision register and receiver in favor of Government.
Italence Placer (Columbia Channel Gold Mining Co.).....	M. E.....	Tahoe.....	140	Hearing held; pending decision.
Rocky Bar placer (Samuel D. Iradier).....	M. E.....	Klamath.....	120	Decision register and receiver in favor of claimant.
Robinson, Samuel H.....	H. E.....	Stanislaus.....	160	Hearing held; pending decision.
Round Valley No. 1 (H. H. Yard).....	M. E.....	Plumas.....	160	Adverse proceedings directed by General Land Office.
Round Valley No. 3 (H. H. Yard).....	M. E.....	do.....	160	New proceedings directed by General Land Office.
Ruple, Joseph.....	H. E.....	Eldorado.....	160	Hearing held; pending decision.
Self, George.....	T. and S.....	Trinity.....	160	Decision register and receiver in favor of Government.
Seneca Larga placer (Joseph Glavor et al.).....	M. E.....	Angels.....	160	Adverse report sent General Land Office.
Smith, Jean.....	H. E.....	Kern.....	160	Do.
Smiths Point placer (Warren Olney, Jr.).....	M. E.....	Plumas.....	80	Adverse proceedings directed by General Land Office.
Springer, Albert G.....	H. E.....	Eldorado.....	160	Do.
Street, Thomas.....	H. E.....	Sequoia.....	160	Do.
Sweetland, Ellen M.....	H. E.....	Stanislaus.....	40	Decision register and receiver in favor of claimant.
Torsion, Carl T.....	H. E.....	Modoc.....	160	Adverse proceedings directed by General Land Office.
Valencia, Joseph H.....	H. E.....	Stanislaus.....	160	Hearing held; pending decision.
Vogt, Charles W.....	H. E.....	Mono.....	100	Decision register and receiver in favor of Government.
Wagner, Marguerite M.....	H. E.....	Stanislaus.....	160	Do.

Walker, Thos. B.	L. S.	Modoc.	520	Adverse proceedings directed by General Land Office.
Do.	L. S.	Shasta.	671.51	Pending in General Land Office.
Do.	L. S.	Modoc.	420	Do.
Do.	L. S.	Shasta and Lassen.	640	Adverse proceedings directed by General Land Office.
Do.	L. S.	Plumas.	600	Do.
Do.	L. S.	Lassen.	1,080	Decision register and receiver in favor of Government.
Do.	L. S.	Plumas.	280	Do.
Do.	L. S.	Shasta.	80	Adverse proceedings directed by General Land Office.
Do.	L. S.	Lassen.	320	Do.
Do.	L. S.	Plumas.	630	Hearing held; pending additional testimony.
Waverly and Marietta placers (Canton Mining Co.)	M. E.	California.		Decision register and receiver in favor of Government.
Weldon, Lora E.	H. E.	Shasta.	160	Pending in General Land Office.
Welsh, J. O.	H. E.	Lassen.	80	Hearing ordered by Commissioner.
Whitaker, George.	H. E.	Plumas.	160	Pending in General Land Office.
White consolidated placer (Quincy Mining & Water Co.)	M. E.	Plumas.	480	
Willow & Miggins Bar (Cata- rael gold mining & Power Co.)	M. E.	do.	100	Decision register and receiver in favor of claimant.
Wilson, George A.	H. E.	Eldorado.	160	Do.
Winfield, Gertrude.	H. E.	Sierra.	160	Adverse report sent General Land Office.
Wright, George.	H. E.	Mono.	160	Pending in General Land Office.
Wright, John.	H. E.	Stanislaus.	160	Hearing held; pending decision.
Adair, Otto M.	H. E.	Cleveland.	160	Held for cancellation.
Adams, Albert.	H. E.	Klamath.	160	Approved for patent.
Ahlerson, John B.	T. and S.	Eldorado.	160	Canceled.
Allen, Fred D.	H. E.	Tahoe.	160	Held for cancellation.
Anderson, Charles J.	T. and S.	do.	160	Approved for patent.
Anderson, George M.	H. E.	do.	160	Relinquished.
Anderson, Walter J.	H. E.	Plumas.	160	Do.
Armas, Miranda Ray.	H. E.	Trinity.	160	Held for cancellation.
Badger consolidated placer (Trinity Gravel Gold Min- ing Co.)	M. E.	Trinity.	1,443.94	Application rejected.
Balf, Edward M.	H. E.	do.	160	Canceled by relinquishment.
Barton, J. E.	H. E.	Sequoia.	160	Canceled.
Bassi, Josephine.	H. E.	Tahoe.	160	Approved for patent.
Beatty, William T.	H. E.	Plumas.	160	Held for cancellation.
Bellard, A.	H. E.	Cleveland.	160	Canceled.
Beronda, Epifanio	H. E.	Santa Barbara.	160	Do.
Bey, Hen.	H. E.	Eldorado.	160	Final certificate authorized.
Biagrace-Cunningham placer.	M. E.	Trinity.	197	Charges not sustained.
Blair, Walter F.	H. E.	Eldorado.	160	Held for cancellation.
Blair, William.	H. E.	do.	160	Do.
Boch, M. N.	H. E.	Cleveland.	120	Canceled.
Bolhall, Austin W.	H. E.	Trinity.	160	Do.
Bolt, Lewis.	H. E.	Plumas.	160	Proceedings dismissed.
Bonetti, Anton.	H. E.	Eldorado.	160	Final certificate authorized.
Bonetti, Charles.	H. E.	Plumas.	160	Proceedings dismissed.
Brady, Edward.	H. E.	Cleveland.	160	Canceled.
Brashear, W. S.	H. E.	Lassen.	160	Proceedings dismissed.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 5—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Brierly, Arlington A.....	H. E.....	Inyo.....	Acres.	Eliminated from Forest.
Buckeye lode and mill site (L. B. Spaulding).....	M. E.....	Kern.....	80	Canceled.
Buckner, Mary.....	H. E.....	Eldorado.....	160	Proceedings dismissed.
Bucks placer (H. H. Yard).....	M. E.....	Plumas.....	160	Canceled.
Bullock, Riley V.....	H. E.....	Shasta.....	160	Application rejected.
California-Nevada consoli- dated placer (H. T. Fowler).....	M. E.....	Tahoe.....	480	Decision in favor of Government.
Casey, Martin S. E.....	H. E.....	do.....	160	Application rejected.
Caus, Martin E.....	H. E.....	California.....	200	Eliminated from Forest.
Cinch placer (W. A. Sledge et al.).....	M. E.....	Stanislaus.....	110	Proceedings dismissed.
Clark, C. W.....	L. S.....	Santa Barbara.....	40	Selection clear listed.
Do.....	L. S.....	do.....	80	Do.
Do.....	L. S.....	Stanislaus.....	560	Do.
Do.....	L. S.....	Santa Barbara.....	40	Do.
Do.....	L. S.....	do.....	40	Do.
Clark, William W.....	H. E.....	Trinity.....	160	Eliminated from National Forest.
Clayton, A. E.....	H. E.....	Stanislaus.....	160	Relinquished.
Collins, Jeremiah.....	L. S.....	Santa Barbara.....	120	Selection clear listed.
Converse, C. A.....	H. E.....	Stanislaus.....	40	Canceled.
Conway, Thurston I.....	H. E.....	Santa Barbara.....	160	Held for cancellation.
Copper Mountain Mining Co.....	M. E.....	Monterey.....	430	Commissioner declared location null and void.
Cordeza, George.....	H. E.....	Kern.....	160	Held for cancellation.
Corkscrew consolidated placer (Quincy Mining & Water Co.).....	M. E.....	Plumas.....	380	Canceled in part; remainder approved for patent.
Cowden, William.....	H. E.....	Stanislaus.....	160	Approved for patent.
Cross, Ernest L.....	H. E.....	Kern.....	160	Eliminated from National Forest.
Curtier, Henry H.....	H. E.....	Lassen.....	160	Approved for patent.
Daniels, John F.....	H. E.....	Plumas.....	160	Canceled.
Dayton, Julia B.....	H. E.....	Monterey.....	160	Case closed.
Dismore, Amella.....	H. E.....	Trinity.....	160	Held for cancellation.
Dismore, Clara.....	H. E.....	do.....	160	Eliminated from National Forest.
Dismore, John B.....	H. E.....	do.....	160	Canceled.
Dismore, Sadie.....	H. E.....	do.....	160	Eliminated from National Forest.
Dismore, Samuel P.....	H. E.....	do.....	160	Do.
Dismore, Truston R.....	H. E.....	do.....	160	Canceled.
Dismore, Wm. J. C.....	H. E.....	do.....	160	Eliminated from National Forest.
Downey, Grace E.....	T. and S.....	California.....	160	Case closed.

Decision of Commissioner in favor of claimant. Application held for rejection.	169 42	Stanislaus..... do.....	H. E. M. E.
Canceled. Held for cancellation. Entry canceled. Canceled. Do. Do. Do. Held for cancellation. Do. Do. Eliminated from National Forest. Canceled. Proceedings dismissed. Do. Patented. Selection clear listed. Canceled. Selection clear listed. Eliminated from National Forest. Held for cancellation. Do. Closed; commissioner's decision. Patented. Proceedings dismissed.	160 160 160 160 160 160 240 160 160 160 160 160 160 40 40 160 200 160 160 240 5	Cleveland Trinity Stanislaus California Lassen Eldorado California Trinity do Tahoe Cleveland California Tahoe Cleveland Tahoe Sierra do do Shasta Tahoe Cleveland California Monterey Tahoe	H. E. H. E. H. E. H. E. H. E. H. E. H. E. T. and S. T. and S. H. E. H. E. H. E. H. E. H. E. L. S. L. S. H. E. H. E. H. E. T. and S. T. and S. H. E. H. E. Mill site.
Approved for patent. Canceled. Recommended for cancellation.	160 160 3,520	Modoc do California Plumas	H. E. H. E. H. E. M. E.
Eliminated from National Forest. Proof held for rejection. Canceled. Do. Patented. Canceled. Held for cancellation. Do. Final certificate authorized. Application rejected. Held for cancellation. Eliminated from National Forest. Canceled. Favorably reported to solicitor. Rejected.	160 160 160 160 160 160 160 160 160 160 160 120 160 37.97	Trinity California Sequoia do do California Tahoe do Sierra Shasta Trinity do Plumas Stanislaus Plumas	H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. H. E. M. E.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 5—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Hyde, F. A.	L. S.	Angeles.	Acres. 109.58	Selection clear listed.
Do.	L. S.	Sierra.	160	Do.
Do.	L. S.	Sequoia.	40	Do.
Do.	L. S.	Angeles.	80	Do.
Jeffry, J. F.	H. E.	Stanislaus.	160	Proceedings dismissed.
Jobe, Abraham L.	H. E.	California.	160	Final proof rejected.
Johnson, Grace.	H. E.	Cleveland.	40	Held for cancellation.
Jones, Wm. A.	H. E.	Idaho.	160	Proceedings dismissed.
Keith, Eddie.	H. E.	Idaho.	160	Held for cancellation.
Kennah, J. P.	H. E.	Stanislaus.	160	Approved for patent.
Kimball, Ida H.	H. E.	Modoc.	160	Held for cancellation.
Kingdon, Henry, et al. (Surprise and East and West National placers).	M. E.	Tahoe.	480	Proceedings dismissed.
Kirkham, Fredericka.	H. E.	Cleveland.	160	Do.
Kirkwood, George A.	D. L. E.	Mono.	160	Canceled.
Kniewel consolidated placer.	M. E.	Plumas.	340	Rejected.
Kresge, John A.	H. E.	Modoc.	160	Approved for patent.
Lamme, Joseph W.	H. E.	do.	160	Canceled.
Lundt, Jergen.	H. E.	Trinity.	160	Eliminated from National Forest.
Lyon, Arthur S.	H. E.	Tahoe.	160	Held for cancellation.
McCann, Inez Z.	H. E.	Cleveland.	160	Proceedings dismissed.
McLaughlin, Y. W.	T. and S.	Sierra.	120	Relinquished.
McLaren, Rhoda G.	H. E.	Cleveland.	160	Canceled.
McLoud, Peter.	H. E.	Trinity.	160	Do.
Madison placer (Harry L. Miller).	M. E.	do.	80	Application rejected.
Mann, A. L.	H. E.	Stanislaus.	160	Canceled.
Maragoti, Guiseppe.	H. E.	Tahoe.	160	Do.
Martin, Clarence L.	H. E.	do.	160	Final certificate authorized.
Martin, Edson.	H. E.	Plumas.	160	Held for cancellation.
Martin, John I.	H. E.	Idorado.	160	Patented.
Martin, O. J.	H. E.	Plumas.	160	Held for cancellation.
Martin, Walter.	H. E.	Tahoe.	160	Referred to Attorney General.
Mason, C. P.	H. E.	California.	160	Do.
Mason, P. S.	H. E.	do.	160	Canceled by relinquishment.
Masterson, Della M.	H. E.	do.	160	Canceled.
Masterson, Julia C.	H. E.	do.	160	Do.
Meacham, Fred W.	H. E.	Santa Barbara.	160	Final certificate authorized.
Meek, Francis M.	H. E.	Cleveland.	160	

Mieson, Sol H.	H. E.	Tahoe.....	160	Proceedings dismissed.
Michell, Emily	H. E.	do.....	163	Held for cancellation.
Montana placer (Geo. A. Keller)	M. E.	do.....	120	Patented.
Moore, Wm. R.	H. E.	Shasta.....	160	Eliminated from National Forest.
Morrison, Matthew G.	H. E.	California.....	160	Final certificate authorized.
Mosier quartz lode (A. Mosier et al.)	M. E.	Angeles.....	20	Deceased null and void.
Mount Pleasant consolidated placer (Jas. C. Hager).	M. E.	Plumas.....	160	Part canceled; remainder approved for patent.
Nealey, Hollie.	T. and S.	California.....	160	Held for cancellation.
Newman, O. G. (wood and water lodes)	M. E.	Kern.....	41, 11	Patent issued.
Nichols, Grace	H. E.	Tahoe.....	160	Do.
Nickel, Rachel E.	H. E.	Klamath.....	160	Canceled.
Niles, Eugene	H. E.	Mojo.....	160	Do.
Nothing, E. J.	H. E.	Tahoe.....	160	Do.
Oaks, Elmer A.	H. E.	California.....	160	Do.
Olson, A.	H. E.	Lassen.....	160	Do.
Owens, George	H. E.	California.....	160	Held for cancellation.
Owens, E. J.	H. E.	Tahoe.....	160	Do.
Patoner, Santiago	H. E.	Cleveland.....	80	Canceled.
Pate, Clarence L.	H. E.	Trinity.....	160	Relinquished.
Price, Jennie B.	H. E.	Cleveland.....	160	Final certificate authorized.
Rafetto, Thos. D.	H. E.	Tahoe.....	163	Held for cancellation.
Rantz, S. H.	H. E.	do.....	163	Do.
Reeg, Oscar O.	H. E.	do.....	160	Do.
Reilly, M. F.	L. S.	Santa Barbara.....	160	Canceled by decision of commissioner.
Rissman, Chas. F. T.	H. E.	Trinity.....	160	Canceled.
Rizzor, Abram	H. E.	do.....	160	Eliminated from National Forest.
Robinson, Chas. M.	H. E.	Inyo.....	80	Canceled.
Roebl, Frank	H. E.	Shasta.....	163	Do.
Ross, William	H. E.	Lassen.....	160	Do.
Rovercraft, A. W.	H. E.	California.....	163	Do.
Russell, H. I.	H. E.	Plumas.....	160	Held for cancellation.
Rutherford, G. E.	H. E.	do.....	160	Canceled.
Rutherford, Robert C.	H. E.	do.....	160	Held for cancellation.
Salgado, M. E.	H. E.	Cleveland.....	160	Cancellation recommended.
Sandis, Ezekiel	H. E.	Monterey.....	160	Proceedings dismissed.
Schermerhorn, Ira L.	H. E.	El Dorado.....	160	Held for cancellation.
Schnack, Chas. F.	H. E.	Shasta.....	160	Favorably recommended.
Schneider, Peter	H. E.	Cleveland.....	160	Entry canceled.
Schroeder, Philippine	H. E.	Trinity.....	160	Do.
Serrano, Florence A.	H. E.	Monterey.....	160	Do.
Sharp, John C.	H. E.	Modoc.....	160	Do.
Shedd, Jay	H. E.	do.....	160	Do.
Shultz, G.	H. E.	Stanislaus.....	160	Held for cancellation.
Silvas, Juan	H. E.	Kern.....	160	Approved for patent.
Silverton, Nellie A.	H. E.	Sequoia.....	160	Notice of favorable action received.
Sloan, Ignacio	H. E.	Cleveland.....	160	Canceled.
Soberanes, Albert O.	H. E.	Monterey.....	120	Final certificate authorized.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 5—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Son Luis lode (Basler Mining & Development Co.).	M. E.	California.....	<i>Acres.</i> 1,821	Eliminated from National Forest.
Spanish Nos. 108 and 113 lodes (H. H. Yard).	M. E.	Plumas.....	320	Canceled.
Speaker, Sylvester.....	H. E.	Stanislaus.....	160	Approved for patent.
Springer, Chas. E.....	H. E.	Cleveland.....	160	Held for cancellation.
Stagg, James M.....	H. E.	Stanislaus.....	160	Final certificate issued.
Stark, Guy Leroy.....	H. E.	Plumas.....	160	Held for cancellation.
Summers, H.....	H. E.	Stanislaus.....	160	Do.
Taylor, George A.....	H. E.	Cleveland.....	160	Favorably reported.
Tehama consolidated placer (N. F. Golden and E. V. Darby).	M. E.	Plumas.....	960	Held for cancellation.
Tennison, C. E.....	H. E.	California.....	160	Canceled.
Thompson, Howard.....	L. S.	Sequoia.....	640	Decision in favor of Government.
Thull, Clarence A.....	H. E.	Tahoe.....	160	Held for cancellation.
Tolinie, Robert.....	H. E.	Trinity.....	160	Final certificate issued.
Tracey, Henry H.....	H. E.	Eldorado.....	160	Held for cancellation.
Trenton placer, No. 1 (E. D. Bannister et al.).	M. E.	Plumas.....	270	Location declared void by commissioner.
Trenton placers Nos. 8, 9, and 10 (E. D. Bannister et al.).	M. E.	do.....	470	Location declared void.
Tupes, Herschel.....	T. and S.	California.....	160	Held for cancellation.
Tyee lode (Basler Mining & Development Co.).	M. E.	do.....	86.91	Eliminated from National Forest.
Utah placer (David McCook).	M. E.	Klamath.....	10	Canceled.
Wathen, John D.....	H. E.	Trinity.....	160	Recommended for cancellation.
Welch, Maurice J.....	H. E.	Tahoe.....	160	Canceled.
White, William.....	H. E.	do.....	160	Approved for patent.
Whitehouse, Isaac C.....	H. E.	Lassen.....	160	Canceled.
Williams, Alice.....	T. and S.	Trinity.....	160	Held for cancellation.
Williams, Hiram.....	H. E.	Inyo.....	160	Eliminated from National Forest
Williams, Rose A.....	H. E.	Stanislaus.....	160	Held for cancellation.
Wilson, Ezra M.....	H. E.	Modoc.....	160	Canceled.
Winfred consolidated placer (Dorsch, H. G.).	M. E.	Plumas.....	160	Relinquished.
Winslow, Seth.....	H. E.	Santa Barbara.....	160	Proceedings dismissed.
Wonnack, Mike G.....	P. C. E.	Sequoia.....	160	Eliminated from National Forest.
Young, G. D.....	H. E.	Stanislaus.....	160	Canceled by relinquishment.

DISTRICT NO. 6.

Abstract Coal Association.....	M. E. (coal).....	Washington.....	Adverse report sent General Land Office. Awaiting hearing.	100	Acres.
Acheson, Joseph.....	H. E.....	Suslaw.....	Do.	100	
Adams, O.....	H. E.....	Crater.....	Adverse proceedings directed by General Land Office. Awaiting hearing.	800	
Alaska Anthracite Coal Co.....	M. E. (coal).....	Chugach.....		1, 639. 30	
Anaska Petroleum Coal Co.....	M. E. (coal).....	do.....			
Albert, George W. H.....	Squatter.....	Crater.....	Adverse report sent General Land Office. Awaiting hearing.	100	
Albert, Mary A.....	H. E.....	do.....	Hearing held; decision not yet rendered.	100	
Anderson, Mary (widow Nells A.).....	H. E.....	Suslaw.....		40	
Andrews, Oliver S.....	T. and S.....	Umatilla.....	Decision of commissioner in favor of Government. Decision of register and receiver in favor of Government. Hearing held; decision not yet rendered.	120	
Apple, Finley E.....	H. E.....	Olympic.....	Awaiting hearing.	100	
Arbogast, Ora.....	H. E.....	Whitman.....	Decision of register and receiver in favor of claimant.	100	
Arwine, Leo.....	T. and S.....	Deschutes.....	Adverse proceedings directed by General Land Office.	100	
Assenheimer, Fred.....	H. E.....	Suslaw.....	Decision of commissioner in favor of Government.	100	
Atkins, Henry.....	H. E.....	do.....		100	
Aune, Arnt.....	H. E.....	Cascade.....		100	
Ayers, Alfred L.....	T. and S.....	Umatilla.....		100	
Ayers, William.....	T. and S.....	do.....		100	
Bailey, Henrietta.....	H. E.....	Crater.....	Awaiting hearing.	100	
Bannister, P. W.....	H. E.....	Fremont.....	Do.	100	
Barker, Benton H.....	H. E.....	Suslaw.....	Adverse proceedings directed by General Land Office. Decision of register and receiver in favor of Government.	100	
Barnore, H. E.....	H. E.....	Chelan.....	Adverse proceedings directed by General Land Office.	120	
Barnes, Elbridge S.....	H. E.....	Suslaw.....	Adverse report sent General Land Office.	100	
Barnett, Marcelus.....	M. E. (coal).....	Rainier.....		100	
Bartley, Charles O.....	H. E.....	Umpana.....		100	
Bell, William A.....	M. E. (coal).....	Rainier.....		100	
Beloit, Eugene.....	H. E.....	Washington.....		100	
Benham, Henry A.....	H. E.....	Columbia.....		100	
Bicknell, Henry I.....	M. E. (coal).....	Rainier.....		100	
Billings, Ernest H.....	T. and S.....	Cascade.....		100	
Bishop, May.....	H. E.....	Crater.....		100	
Bonanza Queen Mining & Milling Co.....	M. E.....	Snoqualmie.....	Adverse report sent General Land Office. Decision of register and receiver in favor of claimant.	138	
Boswell, J. E.....	Squatter.....	Crater.....	Adverse report sent General Land Office. Decision of Commissioner General Land Office in favor of Government.	100	
Bowen, W. C.....	H. E.....	Wenaha.....	Adverse report sent General Land Office.	100	
Bowtle, Catherine.....	M. E. (coal).....	Washington.....	Decision of register and receiver in favor of Government.	100	
Bradshaw, R. H.....	H. E.....	Crater.....	Adverse report sent General Land Office.	100	
Breidenstein, J. W.....	M. E. (coal).....	Washington.....	Awaiting hearing.	100	
Brier, A. D.....	H. E.....	Crater.....	Hearing held; decision not yet rendered.	100	
Breeding, Lee.....	H. E.....	Suslaw.....	Adverse report sent General Land Office.	100	
Briggs, C. P.....	Squatter.....	Crater.....		100	
Briggs, Leonard.....	do.....	do.....	Decision of commissioner in favor of Government.	100	
Brown, Edward.....	T. and S.....	Umatilla.....	Decision of register and receiver in favor of Government.	100	
Brown, John N.....	T. and S.....	Oregon.....	Adverse report sent General Land Office.	100	
Brown, Louis A. (deceased).....	H. E.....	Rainier.....	Decision of register and receiver in favor of claimant.	100	
Broyles, Lorenzo F.....	H. E.....	Columbia.....	Decision of commissioner in favor of claimant.	100	
Bryant, Milton O.....	H. E.....	Suslaw.....		100	

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Burns, Charissa E.	H. E.	Washington.	140	Decision of register and receiver in favor of claimant.
Bush, Albert E.	H. E.	Shuslaw.	100	Decision of commissioner in favor of claimant.
Bush, C. N.	Squatter.	Snoqualmie.	100	Decision of commissioner in favor of Government.
Bush, Walter N.	L. S.	Columbia.	360	Adverse proceedings directed by General Land Office.
Butler, Harold U.	H. E.	Olympic.	100	Decision of commissioner in favor of Government.
Calkins, Rose.	H. E.	Shuslaw.	100	Adverse proceedings directed by General Land Office.
Callahan, L. W.	Squatter.	Snoqualmie.	100	Awaiting hearing.
Carriss, Frank L.	H. E.	Crater.	100	Decision of commissioner in favor of Government.
Carlin Coal Association.	M. E. (coal).	Washington.	560	Adverse report sent General Land Office.
Carlton, David F.	H. E.	Malheur.	100	Decision of register and receiver in favor of Government.
Carnes, Thomas J.	H. E.	Shuslaw.	100	Adverse report sent General Land Office.
Carter, Alta E.	M. E. (coal).	Siskiyou.	160	Decision of commissioner in favor of Government.
Carter, Cecil.	M. E. (coal).	do.	160	Do.
Cascade Coal Association.	M. E. (coal).	Rainier.	480	Hearing held; no decision rendered.
Cavanaugh, Charles.	Squatter.	Snoqualmie.	100	Adverse report sent General Land Office.
Chambers, Andrew W.	M. E. (coal).	Rainier.	100	Awaiting hearing.
Chambers, Elizabeth J.	M. E. (coal).	do.	100	Adverse report sent General Land Office.
Check, Erick O.	H. E.	Fremont.	160	Awaiting hearing.
Chicago Gold Crown Mining Co.	M. E.	Columbia.	162	Adverse proceedings directed by General Land Office.
Chrismon, Louise.	H. E.	Deschutes.	160	Decision of commissioner in favor of Government.
Clarke, C. W.	L. S.	Washington.	240	Adverse proceedings directed by General Land Office.
Cleman, John.	M. E. (coal).	Rainier.	160	Awaiting hearing.
Coleman, Frederick H.	T. and S.	Deschutes.	100	Hearing held; no decision rendered.
Coffman, Thomas J.	M. E. (coal).	Rainier.	100	Adverse proceedings directed by General Land Office.
Compton, M. D.	Squatter.	Snoqualmie.	100	Decision of register and receiver in favor of claimant.
Coppress, Stephen A.	H. E.	Okanogan.	160	Do.
Cordes, H. D.	H. E.	Columbia.	160	Do.
Cordes, Ronald C.	H. E.	Shuslaw.	160	Do.
Courtwright, James F.	M. E. (coal).	Rainier.	160	Adverse proceedings directed by General Land Office.
Courtwright, J. L.	M. E. (coal).	do.	160	Do.
Courtwright, J. Leslie.	M. E. (coal).	do.	160	Do.
Courtwright, Margaret.	M. E. (coal).	do.	160	Do.
Cox, Patrick F.	Squatter.	Snoqualmie.	100	Adverse report sent General Land Office.
Cox, Robert F.	H. E.	Crater.	100	Decision of register and receiver in favor of Government.
Credican, Thomas.	Squatter.	Snoqualmie.	100	Adverse proceedings directed by General Land Office.
Dahack, Zera.	H. E.	Crater.	160	Awaiting hearing.
Darnell, Robert E.	H. E.	Columbia.	100	Decision of register and receiver in favor of claimant.
Davis, Harriet B.	T. and S.	Siskiyou.	160	Awaiting hearing.
Devoe, James W.	H. E.	Columbia.	160	Decision of register and receiver in favor of claimant.

Demorest, Walter O. Coe, claimant).	H. E. M. E.	Olympic. Columbia.	160 20	Do. Hearing held; no decision rendered.
Dennis, A. A.	M. E. (coal). Squatter.	Rainier.	80	Adverse proceedings directed by General Land Office.
Dermott, W. E.	H. E.	Snoqualmie.	160	Decision of commissioner in favor of Government.
Detar, D. Franklin	Dollar, Isaac H.	Rainier.	160	Adverse proceedings directed by General Land Office.
Dills, Isaac H.	M. E. (coal).	Do.	160	Do.
Doak, Frank T.	T. and S.	Deschutes.	160	Hearing held; no decision rendered.
Doak, William H.	T. and S.	do.	160	Do.
Douglas, J. Hiram.	H. E.	Crater.	160	Awaiting hearing.
Dougherty, James.	Squatter.	Snoqualmie.	160	Decision of register and receiver in favor of Government.
Downing, J. H.	Squatter.	Crater.	160	Awaiting hearing.
Druse, Eva I.	M. E. (coal).	Rainier.	160	Adverse proceedings directed by General Land Office.
Druse, John L.	M. E. (coal).	do.	160	Do.
Duelo, Chas.	H. E.	Wenatchee.	120	Do.
Dunbar, Sarah J.	T. and S.	Umpqua.	40	Adverse report sent General Land Office.
Dupreau, George C.	M. E. (coal).	Rainier.	160	Hearing held; no decision rendered.
Dupray, A.	Squatter.	Crater.	120	Adverse report sent General Land Office.
East Crook Coal Association.	M. E. (coal).	Rainier.	640	Hearing held; no decision rendered.
Eberhard, George	Squatter.	Snoqualmie.	160	Adverse proceedings directed by General Land Office.
Edwards, Eugene M.	H. E.	Chelan.	160	Adverse report sent General Land Office.
Edwards, J. W.	Squatter.	Snoqualmie.	160	Decision of commissioner in favor of Government.
Egan, Alfred.	H. E.	Chelan.	160	Decision of register and receiver in favor of Government.
Elwood, James.	L. S.	Olympic.	40	Adverse proceedings directed by General Land Office.
Emerson, E. E.	H. E.	Crater.	160	Awaiting hearing.
Feltton, William R.	M. E. (coal).	Rainier.	160	Decision of register and receiver in favor of Government.
Fendall, Florence.	H. E.	Snoqualmie.	160	Do.
File, Ashton L.	M. E.	Columbia.	160	Decision of commissioner in favor of Government.
Flaming, James.	M. E. (coal).	Siskiyou.	160	Adverse proceedings directed by General Land Office.
Forbes, D. Arthur.	H. E.	Siskiyou.	160	Do.
Forbes, James V.	H. E.	do.	160	Do.
Ford, Fred.	H. E.	Crater.	160	Adverse report sent General Land Office.
Frankovitz, Joseph	M. E. (coal).	Washington.	160	Do.
French, Dennis	H. E.	Olympic.	160	Adverse proceedings directed by General Land Office.
French, B. E.	Squatter.	Snoqualmie.	160	Decision of register and receiver in favor of Government.
Fromm, Theron J.	H. E.	Siskiyou.	160	Hearing held; decision not yet rendered.
Fuller, Chas. W.	T. and S.	Umatilla.	160	Decision of commissioner in favor of Government.
Fuller, Emma C.	T. and S.	do.	160	Do.
Fuller, Maurice.	H. E.	Columbia.	160	Decision of register and receiver in favor of claimant.
Garrison, Daniel.	H. E.	Umpqua.	160	Adverse proceedings directed by General Land Office.
Garnier, Naomi.	T. and S.	Umatilla.	160	Decision of commissioner in favor of Government.
Gary, Paul.	H. E.	Umpqua.	160	Adverse report sent General Land Office.
Gibson, Andrew A.	M. E.	Siskiyou.	160	Adverse proceedings directed by General Land Office.
Glacier Coal Co.	M. E. (coal).	Washington.	640	Adverse report sent General Land Office.
Glass, Albert.	H. E.	Oregon.	160	Decision of register and receiver in favor of Government.
Godin, Samuel.	H. E.	Wenatchee.	160	Do.
Golden Tube Consolidated Mining & Mill Co.	M. E.	Umpqua.	138	Decision of register and receiver in favor of claimant.
Green, Justin W.	H. E.	do.	160	Adverse report sent General Land Office.
Greiner, Joseph, jr.	Squatter.	Snoqualmie.	160	Decision of register and receiver in favor of claimant.
Greiner, Joseph, sr.	Squatter.	do.	160	Do.
Griffiths Austin E.	M. E. (coal).	Washington.	160	Adverse report sent General Land Office.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Gulden, George C.	H. E.	Umatilla.	<i>Acres.</i>	Hearing held; decision not yet rendered.
Haberly, Adolph.	H. E.	Umpqua.	160	Decision of Secretary of Interior in favor of claimant.
Haertele, John.	T. and S.	Crater.	160	Decision of register and receiver in favor of Government.
Hall, Erastus K.	H. E.	do.	160	Decision of commissioner in favor of Government.
Hall, Fred C.	M. E. (coal).	Rainier.	160	Awaiting hearing.
Hall, G. S.	Squatter.	Snoqualmie.	160	Adverse proceedings directed by General Land Office.
Hammersley, John A.	H. E.	Deschutes.	160	Decision of commissioner in favor of Government.
Hammorsley, Arthur.	H. E.	Sislaw.	160	Adverse proceedings directed by General Land Office.
Harris, M. O.	M. E. (coal).	Siskiyou.	160	Decision of commissioner in favor of Government.
Hartman, John P., et al.	M. E.	Sislaw.	160	Hearing held; decision not yet rendered.
Hauemesser, Joseph.	M. E. (coal).	Rainier.	360	Adverse proceedings directed by General Land Office.
Havird, Harvey R.	H. E.	Olympic.	160	Do.
Hawk, A. L.	H. E.	Columbia.	160	Decision of register and receiver in favor of claimant.
Hayden, Jasper.	Squatter.	Snoqualmie.	160	Decision of register and receiver in favor of Government.
Hemphill, Alberto.	H. E.	Sislaw.	120	Adverse proceedings directed by General Land Office.
Harold, H. G.	M. E. (coal).	Rainier.	160	Awaiting hearing.
Higgins, Delazon.	H. E.	do.	160	Decision of register and receiver in favor of Government.
Hill, Amelia E. (née BROWN)	H. E.	Siskiyou.	160	Adverse proceedings directed by General Land Office.
Hinton, Douglas H.	M. E. (coal).	Umpqua.	160	Do.
Hinton, Elva A.	M. E. (coal).	Washington.	160	Do.
Hinz, Paul.	H. E.	do.	160	Adverse report sent General Land Office.
Hoban, Thomas.	Squatter.	Sislaw.	160	Do.
Hofstra, Welke.	H. E.	Snoqualmie.	160	Adverse proceedings directed by General Land Office.
Hoglund, Swan.	H. E.	Sislaw.	160	Do.
Hooker, Elizabeth A.	M. E. (coal).	Siskiyou.	160	Hearing held; decision not yet rendered.
Hopkins, B. C.	Squatter.	Washington.	160	Adverse report sent General Land Office.
Hopkins, Wm. F.	H. E.	Snoqualmie.	160	Decision of commissioner in favor of Government.
Hopkinson, Edwin W.	H. E.	Sislaw.	160	Adverse proceedings directed by General Land Office.
Humphreys, Arthur E.	T. and S.	Columbia.	120	Adverse report sent General Land Office.
Humphreys, Cecil T.	T. and S.	Umatilla.	160	Decision of commissioner in favor of Government.
Humphreys, Harvey.	T. and S.	do.	160	Do.
Humphreys, Thomas J.	T. and S.	do.	160	Do.
Hyde & Co., F. A.	L. S.	do.	160	Do.
Do.	L. S.	Columbia.	40	Do.
Do.	L. S.	do.	360	Adverse proceedings directed by General Land Office.
Do.	L. S.	Snoqualmie.	160	Do.
Do.	L. S.	Washington.	80	Do.
Do.	L. S.	Snoqualmie.	160	Do.
Do.	L. S.	do.	80	Do.
Do.	L. S.	do.	80	Do.

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Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Loflin, Sarah E.	T. and S.	Deschutes.	Acres.	Hearing held; decision not yet rendered.
Loflin, Wilburn H.	T. and S.	do.	100	Do.
Logue, John S.	H. E.	Washington.	100	Decision of register and receiver in favor of Government.
Longley, Chas. W.	H. E.	Suslaw.	100	Adverse report forwarded General Land Office.
Longmire, David.	M. E. (coal).	Rainier.	100	Awaiting hearing.
Longmire, Elcune.	M. E. (coal).	do.	100	Do.
Longmire, Lizzie.	M. E. (coal).	do.	100	Do.
Lowry, Lucinda E.	H. E.	Washington.	100	Adverse proceedings directed by General Land Office.
Lucart, Robert P.	H. E.	Columbia.	100	Do.
Lynch, Oliver.	H. E.	Whitman.	100	Do.
Lysons, Albert C.	H. E.	Columbia.	100	Decision of register and receiver in favor of claimant.
McBride, C. C.	H. E.	Suslaw.	120	Adverse report sent General Land Office.
McClell, Alex E.	M. E. (coal).	Rainier.	100	Awaiting hearing.
McCue, William.	M. E. (coal).	V. enatchee.	100	Adverse report sent General Land Office.
McCumber, Lloyd.	H. E.	Oregon.	100	Do.
McDonald, Angus.	H. E.	Olympic.	100	Decision of commissioner in favor of claimant.
McDonald, Archie.	H. E.	do.	100	Adverse report sent General Land Office.
McDonald, Norman (heirs of).	Squatter.	Colville.	100	Adverse proceedings directed by General Land Office.
McGill, Daniel.	H. E.	Suslaw.	100	Decision of Secretary of Interior in favor of claimant.
McGirr, Alberta.	H. E.	Umatilla.	100	Hearing held; decision not yet rendered.
McGraham, Chas.	H. E.	Oregon.	100	Adverse proceedings directed by General Land Office.
McLaughlin, Millie.	H. E.	Wallowa.	100	Decision of register and receiver in favor of Government.
McLean, Angus.	Squatter.	Snoqualmie.	100	Adverse proceedings directed by General Land Office.
McLish, G. H.	Squatter.	do.	100	Decision of register and receiver in favor of claimant.
McMurphy, W. F.	H. E.	Suslaw.	100	Adverse report sent General Land Office.
Maoney, Jennie.	H. E.	Crater.	100	Do.
Maoney, M.	H. E.	do.	100	Awaiting hearing.
Maki, John.	H. E.	Suslaw.	100	Adverse proceedings directed by General Land Office.
Manning, Mrs. Fannie.	Squatter.	Snoqualmie.	100	Adverse report sent General Land Office.
Marks, Harry P.	H. E.	Suslaw.	100	Decision of register and receiver in favor of Government.
Marks, T. F.	H. E.	Snoqualmie.	100	Decision of commissioner in favor of Government.
Marschke, August.	Squatter.	do.	100	Decision of register and receiver in favor of Government.
Marsino, Victor.	Squatter.	do.	100	Do.
Martin, Killis J.	M. E.	Wallowa.	125	Hearing held; decision not yet rendered.
Mars, J. W.	H. E.	Oregon.	100	Adverse report sent General Land Office.
Merkel, Genevieve.	H. E.	Colville.	100	Decision of commissioner in favor of claimant.
Meadows, Minerva.	T. and S.	Umatilla.	100	Decision of commissioner in favor of Government.
Miller, Alex.	M. E. (coal).	Rainier.	100	Adverse proceedings directed by General Land Office.
Miller, John X.	H. E.	Crater.	100	Decision of register and receiver in favor of claimant.
Mills, John.	T. and S.	Umatilla.	100	Decision of commissioner in favor of Government.

Monson, Carl N.....	H. E.	Rainier.....	190	Do.
Montgomery, Catherine.....	H. E.	Washington.....	160	Adverse report sent General Land Office.
Morrill, Sam.....	H. E.	do.....	160	Adverse proceedings directed by General Land Office.
Morris, J. B.....	H. E.	Siuslaw.....	160	Decision of commissioner in favor of claimant.
Morrison, Frank B.....	H. E.	Columbia.....	160	Adverse proceedings directed by General Land Office.
Morrison, S. S.....	Squatter.....	Unquitta.....	160	Hearing held; decision not yet rendered.
Moyers, Joseph D.....	H. E.	Unquitta.....	160	Adverse report sent General Land Office.
Murphy, John L.....	H. E.	Siuslaw.....	160	Decision of commissioner in favor of Government.
Neal, Oscar F.....	T. and S.....	Unquitta.....	160	Decision of commissioner in favor of Government.
Neely, John W.....	H. E.	Crater.....	160	Do.
Newton, Allen W.....	H. E.	Snoqualmie.....	160	Hearing held; decision not yet rendered.
Nichols, J. B. and Cy. Smith.....	M. E.	Wallowa.....	328	Decision of register and receiver in favor of Government.
Nicholson, Chas. E.....	H. E.	Siuslaw.....	120	Hearing held; decision not yet rendered.
Nisqually Coal Association.....	M. E. (coal).....	Rainier.....	680	Decision of commissioner in favor of Government.
Noah, Amanda.....	H. E.	Siuslaw.....	160	Decision of register and receiver in favor of claimant.
Noonan, Coleman.....	T. and S.....	Crater.....	190	Decision of register and receiver in favor of Government.
O'Christ, Mary Durning.....	H. E.	Olympic.....	160	Decision of commissioner in favor of Government.
O'Connor, C. H.....	Squatter.....	Snoqualmie.....	160	Do.
O'Connor, J. L.....	Squatter.....	do.....	160	Adverse report sent General Land Office.
Olsen, Otis S.....	H. E.	Wallowa.....	160	Adverse proceedings directed by General Land Office.
Orander, William H.....	M. E. (coal).....	Crater.....	160	Decision of register and receiver in favor of Government.
Osse, Sophie.....	H. E.	Crater.....	160	Do.
Ott, John.....	Squatter.....	Snoqualmie.....	160	Adverse report sent General Land Office.
Owens, Evan J.....	H. E.	Siuslaw.....	160	Decision of commissioner in favor of Government.
Pacific Coast Gypsum Manufacturing Co.....	M. E.	Tongass.....	57	Do.
Palmer, Bartetta A.....	H. E.	Okanogan.....	160	Adverse proceedings directed by General Land Office.
Paradise group of lode claims (Bohemian Gold Mining Co., claimant).....	M. E.	Unquitta.....	37	Do.
Parker, Fred.....	M. E. (coal).....	Rainier.....	160	Awaiting hearing.
Parker, Lois I.....	M. E. (coal).....	do.....	160	Adverse report sent General Land Office.
Parks, B. F.....	Squatter.....	Snoqualmie.....	160	Adverse proceedings directed by General Land Office.
Parsons, A. S.....	Squatter.....	do.....	160	Decision of register and receiver in favor of Government.
Pennington Mark.....	M. E. (coal).....	Rainier.....	160	Awaiting hearing.
Phelps, A. M.....	H. E.	Oregon.....	80	Adverse proceedings directed by General Land Office.
Phelps, Ira S.....	H. E.	do.....	160	Do.
Phelps, Ralph.....	H. E.	do.....	160	Do.
Phoenix Mining Syndicate.....	M. E.	Snoqualmie.....	40	Do.
Pichette, Theo.....	Squatter.....	do.....	160	Decision of commissioner in favor of Government.
Pickens, Samuel D.....	H. E.	Cascade.....	160	Do.
Pierson, Elias.....	M. E. (coal).....	Siskiyou.....	160	Do.
Pierson, J. E.....	M. E. (coal).....	do.....	160	Do.
Pierson, K.....	M. E. (coal).....	do.....	160	Do.
Pierson, Z. P.....	M. E. (coal).....	do.....	160	Do.
Plessinger, Wallace.....	H. E.	Okanogan.....	160	Hearing held; decision not yet rendered.
Polson, Alexander.....	M. E. (coal).....	Washington.....	160	Adverse report sent General Land Office.
Pond, G. O.....	H. E.	Crater.....	160	Decision of register and receiver in favor of Government.
Potter, Edward W.....	H. E.	Washington.....	160	Adverse proceedings directed by General Land Office.
Powers, F.....	M. E. (coal).....	do.....	160	Adverse report sent General Land Office.
Powles, J. F.....	Squatter.....	Wenatchee.....	160	Hearing held; decision not yet rendered.
Proctor, John G.....	H. E.	Okanogan.....	80	Adverse proceedings directed by General Land Office.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
			<i>Acres.</i>	
Prosser, J. V.	Squatter	Snoqualmie	100	Decision of register and receiver in favor of Government.
Pruyn, William E.	T. and S.	Umatilla	160	Decision of commissioner in favor of Government.
Pulford, Samuel D.	M. E. (coal)	Siskiyou	160	Do.
Rankin, George S.	M. E. (coal)	Rainier	160	Adverse proceedings directed by General Land Office.
Reeves, S.	M. E. (coal)	Siskiyou	160	Decision of commissioner in favor of Government.
Reich, Max	M. E. (coal)	Rainier	160	Adverse report sent General Land Office.
Richard, Caro C.	H. E.	Suslaw	160	Decision of register and receiver in favor of Government.
Riggs, Harry B.	M. E. (coal)	Rainier	160	Adverse proceedings directed by General Land Office.
Roberts, Ephraim	H. E.	Deschutes	160	Awaiting hearing.
Robinette, H. J.	T. and S.	Umpqua	160	Adverse report sent General Land Office.
Robinson, James T.	H. E.	Deschutes	160	Hearing held; decision not yet rendered.
Robinson, John M.	H. E.	Suslaw	160	Adverse report sent General Land Office.
Roe, George W.	Squatter	Tongass	120	Do.
Roosevelt Association Placer	M. E.	Washington	160	Do.
(Michael Pigott et al., claimants)				
Rothrick, Enoch B.	Squatter	Snoqualmie	160	Adverse proceedings directed by General Land Office.
Rotter, Adolph	M. E. (coal)	Rainier	160	Hearing held; decision not yet rendered.
Rotter, Vincent	M. E. (coal)	do.	160	Adverse report sent General Land Office.
Rowe, Harry	M. E. (coal)	do.	160	Awaiting hearing
Russell, S. E.	H. E.	Okanagan	160	Adverse report sent General Land Office.
Ryan, Royal W.	H. E.	Suslaw	160	Do.
Sagendorf, Sherrill	H. E.	do.	80	Adverse proceedings directed by General Land Office.
Saundon E. L.	Squatter	Snoqualmie	160	Decision of register and receiver in favor of Government.
Saling, Allen W.	T. and S.	Umatilla	160	Decision of commissioner in favor of Government.
Salt Creek Springs lode	M. E.	Cascade	40	Adverse report sent General Land Office.
(Brown & Hardine et al., claimants)				
Sanford, Elijah	M. E. (coal)	Rainier	160	Awaiting hearing.
Schalling, Edward	H. E.	Suslaw	160	Adverse proceedings directed by General Land Office.
Schoenberg, August	H. E.	Oregon	160	Adverse report sent General Land Office.
Schoenberg, Barney	H. E.	do.	160	Do.
Scott, William W.	H. E.	Crater	160	Awaiting hearing.
Seibert, Charles H. (heir of R. D.)	Squatter	Colville	160	Adverse proceedings directed by General Land Office.
Servis, L.	Squatter	Snoqualmie	160	Decision of register and receiver in favor of claimant.
Servis, W. E.	Squatter	do.	160	Decision of register and receiver in favor of Government.
Shaw, F. C.	M. E. (coal)	Washington	160	Adverse report sent General Land Office.
Shaw, Fred L.	T. and S.	Whitman	160	Hearing held; decision not yet rendered.
Shaw, Wallace	H. E.	Oregon	160	Decision of register and receiver in favor of Government.

Shea, George E.	Squatter.	Snoqualmie.	100	Do.
Sherbet, C. P.	H. E.	Siuslaw.	100	Adverse report sent General Land Office.
Serviner, Mattie B.	T. and S.	Umatilla.	100	Decision of commissioner in favor of Government.
Serviner, William P.	T. and S.	do.	100	Do.
Shields, Richard.	M. E. (coal).	Washington.	100	Adverse report sent General Land Office.
Skagit Lime & Cement Co.	M. E.	do.	157	Do.
Small, John M.	M. E.	Snoqualmie.	120	Hearing held; decision not yet rendered.
Smith, Chas. A.	H. E.	Okanogan.	100	Decision of register and receiver in favor of Government.
Smith, H. C.	L. S.	Siskiyou.	1, 280	Adverse report sent General Land Office.
Smith, Martin V.	H. E. (coal).	Washington.	100	Adverse report sent General Land Office.
Smith, Mrs. Melroe.	H. E.	Malheur.	100	Adverse proceedings directed by General Land Office.
Smith, Newton I.	M. E. (coal).	Washington.	100	Adverse report sent General Land Office.
Smith, M. J.	H. E.	Crater.	100	Do.
Smith, Thomas.	Squatter.	Snoqualmie.	100	Decision of register and receiver in favor of Government.
Smith, Walter.	H. E.	Malheur.	100	Do.
Snead, Vincent B.	H. E.	Valley.	100	Decision of commissioner in favor of Government.
Snyder, Ed.	T. and S.	Unpqua.	100	Adverse proceedings directed by General Land Office.
Snyder, J. C.	H. E.	Tongass.	100	Decision of register and receiver in favor of Government.
Souer, E. D.	H. E.	Rainier.	100	Awaiting hearing.
Spencer, Anna F.	H. E.	Olympic.	100	Adverse proceedings directed by General Land Office.
Spencer, Septimus.	T. and S.	Umatilla.	100	Decision of commissioner in favor of Government.
Stanford, John T.	T. and S.	do.	100	Do.
Stanton, Geo. A.	H. E.	Columbia.	100	Decision of register and receiver in favor of Government.
Starr, Geo.	Squatter.	Crater.	100	Adverse proceedings directed by General Land Office.
Stauff, Chas. W.	H. E.	Oregon.	100	Hearing held; decision not yet rendered.
Stratton, Adrian N.	H. E.	Colville.	80	Decision of register and receiver in favor of Government.
Stuart, John P.	T. and S.	Siuslaw.	100	Decision of register and receiver in favor of claimant.
Summers, James M.	M. E. (coal).	Deschutes.	100	Decision of register and receiver in favor of Government.
Swab, Mike.	H. E.	Washington.	100	Decision of register and receiver in favor of Government.
Swager, Frank H.	Squatter.	Siuslaw.	100	Adverse report sent General Land Office.
Sunset mill site (L. A. Babcock, claimant).	H. E.	Snoqualmie.	100	Awaiting hearing.
Tanner, Joel R.	M. E.	Columbia.	5	Decision of register and receiver in favor of claimant.
Templeton, Floyd C.	H. E.	Tongass.	100	Adverse proceedings directed by General Land Office.
Terrell, Charley.	H. E.	Siuslaw.	100	Decision of register and receiver in favor of Government.
Texas group lode (Alaska Industrial Co., Ltd.).	M. E.	Crater.	311	Adverse report sent General Land Office.
Thompson, J. M.	M. E.	Tongass.	100	Adverse proceedings directed by General Land Office.
Thorp, Alonzo G.	H. E.	Siskiyou.	100	Hearing held; decision not yet rendered.
Tingley, Algernon.	H. E.	Siuslaw.	100	Decision of register and receiver in favor of Government.
Vanderbilt, Cornelius J.	M. E. (coal).	Oregon.	80	Adverse proceedings directed by General Land Office.
Vermont Association placer (H. H. Brown et al., claimants).	M. E.	Wenatchee.	40	Adverse report sent General Land Office.
Victoria et al. lodes (J. M. Scott, claimant).	M. E.	Snoqualmie.	100	Adverse proceedings directed by General Land Office.
Vogl, L. H.	do.	do.	145	Awaiting hearing.
Walker, James L.	Squatter.	do.	100	Adverse proceedings directed by General Land Office.
Wachman, H. T.	H. E.	Wenaha.	100	Adverse report sent General Land Office.
Warren, Henry E.	M. E. (coal).	Rainier.	100	Hearing held; decision not yet rendered.
	T. and S.	Umatilla.	100	Decision of commissioner in favor of Government.

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Watson, Daniel B.	H. E.	Crater.	Acres.	Decision of register and receiver in favor of Government.
Watson, Edmund H.	H. E.	do.	100	Decision of commissioner in favor of Government.
Wedekamper, Henry W.	H. E.	Suslaw.	100	Decision of register and receiver in favor of claimant.
Welkel, L. C.	M. E. (coal).	Rainier.	100	Adverse proceedings directed by General Land Office.
Weisz, Chas. D.	H. E.	Dweshutes.	100	Decision of commissioner in favor of Government.
Welch, John.	Squatter.	Shoqualmie.	100	Adverse proceedings directed by General Land Office.
West Coast Mines Co.	M. E.	Unquappa.	64	Do.
Do.	M. E.	do.	159	Adverse report sent General Land Office.
Wheeler, Elmer K.	M. E. (coal).	Rainier.	100	Awaiting hearing.
Wheeler, Levant C.	M. E. (coal).	do.	100	Do.
Whelock, Mary A.	H. E.	Wallowa.	100	Do.
White, John H.	H. E.	Rainier.	100	Decision of commissioner in favor of Government.
Whites, George.	T. and S.	Unatilla.	100	Awaiting hearing.
Whitson, Alex. B.	M. E. (coal).	do.	100	Do.
Whitson, Edward.	M. E. (coal).	Unatilla.	100	Do.
Williams, Clayton J.	H. E.	do.	100	Decision of register and receiver in favor of Government.
Wilson, Frank B.	H. E.	V. enatchee.	100	Adverse report sent General Land Office.
Wilson, John J.	H. E. (coal).	Washington.	100	Adverse proceedings directed by General Land Office.
Winters, Comfort B.	H. E.	Suslaw.	100	Decision of register and receiver in favor of claimant.
Wood, Alberton.	H. E.	Olympic.	100	Adverse proceedings directed by General Land Office.
Wood, Lee.	M. E.	Unquappa.	320	Hearing held; decision not yet rendered.
Wood, Lina B.	T. and S.	Dweshutes.	100	Decision of register and receiver in favor of Government.
Woodruff, G. L.	M. E.	do.	100	Adverse proceedings directed by General Land Office.
Woodward, George D.	H. E.	Washington.	100	Decision of register and receiver in favor of Government.
Woodward, John.	T. and S.	Colville.	100	Decision of register and receiver in favor of claimant.
Wright, Burke E.	H. E.	Unatilla.	100	Adverse proceedings directed by General Land Office.
Wright, David E.	H. E.	Suslaw.	100	Hearing held; decision not yet rendered.
Yates, Frank J.	M. E. (coal).	Rainier.	100	Decision of register and receiver in favor of Government.
Young, Arthur J.	Squatter.	Suslaw.	100	Decision of register and receiver in favor of claimant.
Agree, Otto W.	H. E.	Unatilla.	100	Decision of commissioner in favor of Government.
Albro, John.	H. E.	Suslaw.	100	Awaiting hearing.
Allen, Harry A.	H. E.	Suslaw.	100	Adverse proceedings directed by General Land Office.
Anderson, Augusta E.	H. E.	Shoqualmie.	100	Do.
Do.	H. E.	Unquappa.	100	Do.
Anderson, John.	Squatter.	Crater.	100	Do.
Armstrong, Robert A.	M. E. (coal).	Siskiyou.	120	Entry rejected by commissioner.
Babcock, Burton.	Squatter.	do.	80	Application rejected by commissioner.
Bachelor, Nora.	Squatter.	Olympic.	100	Adverse proceedings dismissed by commissioner.
R. C. Hensley, heir.	H. E.	Washington.	100	Patented.
Dallington, Paul.	H. E.	Crater.	100	Canceled.
Do.	H. E.	Oregon.	100	Approved for patent.
Do.	H. E.	Oregon.	100	Canceled.

Harelske, Gus.....	H. E.	Snoqualmie.....	160	Adverse proceedings dismissed by commissioner.
Barclay, P.....	H. E.	Deschutes.....	160	Canceled.
Bates, George.....	H. E.	Cascade.....	160	Adverse proceedings dismissed by commissioner.
Beckman, Harley A.....	H. E.	Sislaw.....	160	Canceled.
Billings, Andrew.....	H. E.	.....do.....	160	Do.
Black, Daniel A.....	H. E.	Wenatchee.....	120	Decision of commissioner in favor of claimant.
Blumenstein, John H.....	H. E.	Sislaw.....	160	Canceled.
Bollman, Abram J.....	H. E.	Crater.....	160	Decision of Secretary of Interior in favor of Government.
Borgen, Christian G.....	H. E.	Umatilla.....	160	Canceled.
Boyce, Ira G.....	H. E.	Sislaw.....	160	Do.
Brooks, Albert R.....	H. E.	Rainier.....	124	Do.
Brown, F. S.....	M. E. (coal).	Cascade.....	160	Do.
Belknap, Arthur.....	H. E.	Columbia.....	160	Relinquished.
Bower, Isaac H.....	H. E.	Sislaw.....	160	Canceled.
Brown, Walter L.....	H. E.	Colville.....	160	Do.
Bryant, Clarence F.....	H. E.	.....do.....	160	Do.
Campbell, Sarah A.....	H. E.	Cascade.....	160	Patented.
Carlin, Henry W.....	T. and S.	Snoqualmie.....	217	Adverse proceedings dismissed by commissioner (evidence insufficient).
Carmack Gold & Consolidated Mining Co.....	M. E.	Sislaw.....	160	Canceled.
Carter, Ira G.....	H. E.	Snoqualmie.....	160	Do.
Case, Chas. R.....	H. E.	Malheur.....	40	Decision of commissioner in favor of claimant.
Cavender, James P.....	H. E.	Sislaw.....	160	Decision of Secretary of the Interior in favor of United States.
Chambers, Frank L.....	T. and S.	Deschutes.....	160	Canceled.
Childers, Thomas L.....	T. and S.	Sislaw.....	160	Do.
Collins, Gustavus.....	H. E.	Colville.....	160	Decision of Secretary of the Interior in favor of claimant.
Combs, Vivla L.....	H. E.	Washington.....	160	Decision of commissioner in favor of United States.
Conoway, George B.....	Squatter.	.....do.....	160	Application rejected by commissioner.
Corrigan, Sherman.....	Squatter.	Rainier.....	160	Canceled.
Cothary, William H.....	H. E.	Snoqualmie.....	160	Do.
Crapp, A. D.....	Squatter.	Sislaw.....	160	Do.
Culver, Clarence E.....	H. E.	.....do.....	160	Do.
Culver, Cyrus.....	H. E.	Umatilla.....	160	Eliminated.
Culver, Jesse L.....	H. E.	Sislaw.....	160	Canceled.
Curtiss, Edward S.....	H. E.	.....do.....	160	Do.
Darby, James W.....	H. E.	Malheur.....	160	Decision of commissioner in favor of claimant.
Davis, James H.....	H. E.	.....do.....	160	Decision of Secretary of the Interior in favor of claimant.
Dickinson, Ashley D.....	H. E.	Crater.....	160	Adverse proceedings dismissed by commissioner (evidence insufficient).
Dickenson, Geo. R.....	H. E.	William.....	16	Canceled.
Dickson, Wm. P.....	M. E.	Deschutes.....	160	Adverse proceedings dismissed by commissioner (evidence insufficient).
Double Eagle Mining Co.....	M. E.	William.....	160	Decision of Secretary of the Interior in favor of claimant.
Edly, George C.....	H. E.	Columbia.....	160	Decision of Secretary of the Interior in favor of United States.
Elliot, Lewis E.....	H. E.	Sislaw.....	160	Decision of commissioner in favor of claimant.
England, John.....	H. E.	Crater.....	160	Canceled.
Erhart, Peter.....	H. E.	Wenatchee.....	120	Do.
Esterly, Francis P.....	H. E.	Sislaw.....	160	Decision of Secretary of the Interior in favor of claimant.
Estes, A. F.....	H. E.	Wallowa.....	160	Adverse proceedings dismissed by Secretary of the Interior.
Ewing, Chas.....	H. E.	Deschutes.....	160	Decision of Secretary of the Interior in favor of claimant.
Fallman, Nina A.....	H. E.	Washington.....	160	
Farr, John.....	Squatter.			
Perrier, Herbert.....				

Cases involving claims to lands in the National Forests under homestead, timber and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant.	Character of claim.	National Forest.	Quantity of land.	Status June 30, 1911.
Fisher, Albert O.	H. E.	Crater.	160	Canceled.
Fishes, Catherine O.	H. E.	Shuslaw.	160	Do.
Forbes, Catherine O.	H. E.	do.	160	Do.
Forbes, Charles D.	H. E.	Rainier.	160	Decision of Secretary of the Interior in favor of claimant.
Foss, Henry A.	H. E.	Shuslaw.	160	Canceled.
Foster, Myrtle.	H. E.	Siskiyou.	120	Approved for patent by commissioner.
Frodelius, Bernhart.	H. E.	Shuslaw.	160	Canceled.
Fry, Chas. H.	H. E.	do.	160	Do.
Gerking, Hilary.	H. E.	Colville.	160	Do.
Gibbin, William.	H. E.	Shuslaw.	40	Do.
Gibson, John M.	H. E.	Deschutes.	160	Do.
Gillenwater, John C.	H. E.	Washington.	160	Decision of Secretary of the Interior in favor of United States.
Glover, David E.	H. E.	Deschutes.	40	Canceled.
Goodman, Weaver.	H. E.	Crater.	160	Do.
Grace, Martin.	H. E.	Colville.	160	Canceled by commissioner.
Grant, E. W.	H. E.	Chelan.	160	Do.
Green, A. T.	H. E.	Snoqualmie.	160	Canceled.
Greiner, Joseph H.	Squatter.	do.	160	Relinquished.
Grignon, L. P.	Squatter.	Crater.	160	Claim covered by patented timber and stone claim.
Grisswell, Harry A.	H. E.	Shuslaw.	40	Canceled.
Gurney, Voltaire.	H. E.	Tongass.	33	Eliminated from National Forest.
Hadley Consolidated Copper Co.	M. E.	Wenaha.	80	Decision of commissioner in favor of United States.
Hagen, Bernhardt.	H. E.	Deschutes.	160	Canceled.
Hammond, Emma A.	H. E.	Whitman.	160	Do.
Hanson, Chas.	H. E.	Okanogan.	160	Do.
Hanson, Peter.	H. E.	Rainier.	120	Decision of Secretary of the Interior in favor of claimant.
Hart, Irving.	Squatter.	do.	160	Decision of Secretary of the Interior in favor of United States.
Harding, Roswell B.	H. E.	Fremont.	160	Canceled.
Hardisty, Laura O.	H. E.	Rainier.	160	Application rejected by commissioner.
Hackman, Peter Y.	M. E. (coal)	Shuslaw.	160	Canceled.
Herman, Cyrus F.	H. E.	Tongass.	247	Adverse proceedings dismissed by commissioner (evidence insufficient).
Hetta Mountain Copper Co.	M. E.	Okanogan.	5	Decision of commissioner in favor of United States.
Hidden Treasure Mining & Milling Co.	M. E.	Colville.	160	Canceled.
Holme, William H.	H. E.	Cascade.	160	Do.
Hollinshead, Jonathan.	H. E.	Shuslaw.	160	Do.
Hoover, George L.	Squatter.	Snoqualmie.	160	Decision of commissioner in favor of United States.
Hopkins, Mrs. Louis.	H. E.	Siskiyou.	160	Approved for patent.
Houghton, Mary.	H. E.	Shuslaw.	160	Do.
Horsfall, William.	H. E.		160	

Howell, Glenn.....	H. E.	do.....	100	Canceled.
Hoy, Franklin P.....	H. E.	do.....	100	Decision of Secretary of the Interior in favor of claimant.
Iddings, James P.....	H. E.	Wenatchee.....	100	Canceled.
Ivie, John B.....	H. E.	Sluslaw.....	160	Do.
James, William H.....	H. E.	do.....	160	Do.
Jameson, Epaphroditus.....	H. E.	Malheur.....	160	Decision of Secretary of the Interior in favor of United States.
Johns, Phil S.....	H. E.	Columbia.....	160	Decision of Secretary of the Interior in favor of claimant.
Johnson, Edith.....	H. E.	Wallawa.....	160	Eliminated.
Johnson, Clarence D.....	T. and S.	Deschutes.....	160	Canceled.
Johnson, Eldon E.....	H. E.	Malheur.....	160	Do.
Johnson, Ira G.....	H. E.	Crater.....	160	Do.
Johnson, Willis L.....	H. E.	Sluslaw.....	160	Decision of Secretary of the Interior in favor of claimant.
Jones, Ben F.....	T. and S.	Deschutes.....	160	Application rejected by commissioner.
Jones, W. G.....	Squatter.....	Snoqualmie.....	160	Decision of commissioner in favor of United States.
Jones, W. H.....	Squatter.....	do.....	160	Canceled.
Klinker, Julius.....	Squatter.....	do.....	160	Decision of commissioner in favor of claimant.
Lachapelle, Nora.....	Squatter.....	Washington.....	160	Canceled.
Lambert, Bertha E.....	T. and S.	Whitman.....	160	Decision of commissioner in favor of claimant.
Lander, Mildred.....	H. E.	Sluslaw.....	160	Canceled.
LeBallister, Mary.....	H. E.	Unatilla.....	160	Do.
Lehrman, Fred.....	H. E.	Wenatchee.....	160	Do.
Lerwill, Walter B.....	H. E.	Uniquia.....	160	Do.
Leslie, George W.....	H. E.	Sluslaw.....	160	Decision of Secretary of the Interior in favor of United States.
Liles, John R.....	H. E.	do.....	160	Canceled.
Lundemo, Erick.....	H. E.	Colville.....	160	Do.
Lynch, Ornum.....	H. E.	Sluslaw.....	160	Do.
Lyons, Chas.....	Squatter.....	Washington.....	160	Do.
Lyons, Dora.....	H. E.	Deschutes.....	160	Relinquished.
McCart, Fred H.....	H. E.	Sluslaw.....	40	Canceled.
McDonald, Emily.....	H. E.	Deschutes.....	160	Do.
McKay, James T.....	H. E.	Olympic.....	160	Adverse proceedings dismissed by commissioner.
McPherson, Alvin W.....	H. E.	Crater.....	160	Canceled.
Madden, John T.....	T. and S.	Whitman.....	160	Patented.
Marsee, William B.....	H. E.	Sluslaw.....	160	Canceled.
Miller, Harry I.....	H. E.	do.....	160	Do.
Moore, Rensselaer.....	T. and S.	Deschutes.....	160	Do.
Morris, D. S.....	Squatter.....	Snoqualmie.....	160	Do.
Morris, Made.....	T. and S.	Unatilla.....	160	Do.
Morrisey, P. H.....	Squatter.....	Snoqualmie.....	160	Do.
Nason, William.....	H. E.	Sluslaw.....	160	Do.
Needham, William J.....	H. E.	Wallawa.....	40	Do.
Newman, Agnes.....	H. E.	do.....	160	Patented.
Neiglick, Carl.....	T. and S.	Sluslaw.....	160	Canceled.
Nightwander, Frank E.....	H. E.	do.....	160	Decision of commissioner in favor of claimant.
Nobel, Arthur B.....	H. E.	Whitman.....	80	Canceled.
Norris, Theo. A.....	H. E.	Crater.....	160	Decision of Secretary of the Interior in favor of United States.
Odell, Marinda.....	H. E.	Wenatchee.....	160	Do.
Oren, Albert.....	H. E.	Sluslaw.....	160	Canceled.
Parish, Almond W.....	T. and S.	Siskiyou.....	160	Decision of Secretary of the Interior in favor of claimant.
Parke, Sarah.....	H. E.	Crater.....	160	Canceled.
Peterson, John A.....	H. E.	Sluslaw.....	160	Do.
Pete Kelly Claim (Cascade Mtn. Co., claimant).	M. E.	Wenatchee.....	20	Adverse proceedings dismissed.

Cases involving claims to lands in the National Forests under homestead, timber, and stone, mineral, desert-land, and other laws, pending, acted upon, or closed during fiscal year 1911—Continued.

DISTRICT NO. 6—Continued.

Claimant	Character of claim	National Forest.	Quantity of land.	Status June 30, 1911.
Pitts, Luke W.....	H. E.	Rainier.....	Acres. 160	Decision of commissioner in favor of claimant.
Poole, Alma.....	H. E.	Sluslaw.....	160	Canceled.
Pope, Albert W. (deceased).....	H. E.	Cascade.....	160	Do.
Post, Jessie J. (now Johnson).....	H. E.	Wallowa.....	160	Relinquished.
Rady, Albert.....	H. E.	Columbia.....	160	Do.
Ralls, Charles J.....	H. E.	Sluslaw.....	160	Canceled.
Rasmus, John W.....	H. E.	Umatilla.....	160	Decision of Secretary of the Interior in favor of United States.
Rau, Michael.....	H. E.	Fremont.....	160	Patented.
Robbins, Emory.....	M. E. (coal).	Siskiyou.....	160	Application rejected by commissioner.
Ross, Daniel M.....	H. E.	Sluslaw.....	160	Adverse proceedings dismissed by commissioner (evidence insufficient).
Russell, Alzina C.....	H. E.	Wenatchee.....	160	Canceled.
Ryan, Thomas C.....	H. E.	Deschutes.....	160	Reported favorably to Interior Department by Forest Service.
Sands, John.....	H. E.	Sluslaw.....	160	Canceled.
Savage, Charles I.....	H. E.	do.....	160	Patented.
Searff, John.....	H. E.	Malheur.....	160	Canceled.
Schadler, Evelyn.....	H. E.	Okanogan.....	160	Forest Service withdrew protest.
Schirbel, Charles P.....	H. E.	Sluslaw.....	160	Canceled.
Schmidt, Louis, Jr.....	H. E.	Wallowa.....	160	Decision of commissioner in favor of claimant.
Sharp, Wm.....	H. E.	Sluslaw.....	160	Approved for patent.
Shepherd, J.....	Squatter.	Snoqualmie.....	160	Canceled.
Shields, Emmet W.....	H. E.	Umatilla.....	160	Eliminated from National Forest.
Shoemaker, Millard F.....	T. and S.	Siskiyou.....	160	Approved for patent.
Shoop, Chas. N.....	H. E.	Deschutes.....	160	Decision of Secretary of the Interior in favor of claimant.
Shoop, Hector L.....	H. E.	do.....	160	Canceled.
Shuffelt, Hart.....	H. E.	Snoqualmie.....	160	Adverse proceedings dismissed by Secretary of the Interior.
Shuman, Allen.....	Squatter.	Rainier.....	160	Relinquished.
Shutt, Calvin H.....	H. E.	Columbia.....	160	Decision of Secretary of the Interior in favor of claimant.
Silverman, Simon.....	H. E.	Snoqualmie.....	160	Decision of commissioner in favor of claimant.
Simmons, Carl C.....	H. E.	Sluslaw.....	160	Canceled.
Slate, Martha.....	H. E.	do.....	160	Do.
Small, Nancy Lena.....	H. E.	Rainier.....	160	Decision of commissioner in favor of claimant.
Smith, George M.....	H. E.	Sluslaw.....	160	Canceled.
Snyder, Edwin A.....	H. E.	Fremont.....	160	Protest withdrawn by Forest Service.
Spedle, Andrew.....	H. E.	Chelan.....	160	Relinquished.
Spencer, Eda.....	H. E.	Crater.....	160	Canceled.
St. Thomas, John.....	H. E.	Fremont.....	160	Relinquished.
Stalker, John L.....	H. E.	Sluslaw.....	120	Canceled.
Stephens, Arthur L.....	H. E.	do.....	160	Decision of commissioner in favor of claimant.
Strake, Emma M.....	H. E.	do.....	160	Canceled.
Strougen, Anton.....	T. and S.	Colville.....	160	Do.

Sullivan, John..... Telurium Quartz Mining Claim	Squatter. M. E.	Washington. Whitman	Do. Adverse proceedings dismissed by commissioner (evidence insufficient).
Thomas, John V.....	H. E.	Shuslaw	Canceled.
Thomas, Marion.....	H. E.	Colville	Eliminated from National Forest.
Thompson, Alexander.....	H. E.	Umpqua	Commissioner dismissed adverse proceedings.
Thompson, Elizabeth J.....	H. E.	Umatilla	Eliminated from National Forest.
Thompson, William B.....	H. E.	Washington	Decision of commissioner in favor of United States.
Tipton, Lovell E.....	H. E.	Whitman	Outside National Forest.
Topham-La Blue, Elizabeth.....	H. E.	Shuslaw	Approved for patent.
Truax, John.....	Squatter.	Washington	Canceled.
Tullock, Llewellyn.....	H. E.	Shuslaw	Do.
Ulvested, Martin.....	H. E.	Crater	Decision of Secretary of the Interior in favor of claimant.
Unicune, W. A.....	H. E.	Colville	Canceled.
Uptagrove, Frank A.....	H. E.	do	Do.
Vriedt, Johan.....	H. E.	Deschutes	Do.
Wakefield, G. N.....	M. E.	Tongass	Decision of commissioner in favor of claimant.
Walton, Preston H.....	H. E.	Shuslaw	Canceled.
Warman, James W.....	H. E.	Whitman	Adverse proceedings dismissed by commissioner.
Watkins, Joe.....	H. E.	Shuslaw	Canceled.
Weaver, Charles.....	H. E.	do	Do.
Webster, Julius.....	H. E.	Olympic	Decision of Secretary of the Interior in favor of United States.
Weir, John.....	Squatter.	Snoqualmie	Location covered by N. F. scrip location.
Weiss, Henry C.....	H. E.	Shuslaw	Canceled.
Welch, Ida B.....	H. E.	Wallawa	Canceled.
Wertz, Clarence M.....	H. E.	Shuslaw	Decision of Secretary of the Interior in favor of claimant.
White, Hortense R.....	H. E.	Colville	Canceled.
Wilbur, Ephraim.....	H. E.	Wenaha	Decision of commissioner in favor of claimant.
Williams, Geo. W.....	H. E.	Malheur	Decision of Secretary of the Interior in favor of United States.
Wilson, W. Q.....	H. E.	Shuslaw	Decision of commissioner in favor of claimant.
Wing, Walter.....	H. E.	Fremont	Decision of Secretary of the Interior in favor of claimant.
Winton, W. H.....	H. E.	Umpqua	Canceled.
Witham, Albert A.....	H. E.	Fremont	Do.
Young, Charles E.....	H. E.	Wallawa	Eliminated from National Forest.
Zwang, Jettcher.....	T. and S.	Colville	Canceled.

Applications presented and pending for patents which were prosecuted by the Solicitor for department employees during the fiscal year ended June 30, 1911.

Applicant.	Bureau or office.	Invention.	Disposition of application.
George F. Mitchell.....	Plant Industry.....	Shrub and plant trimming machine.	Patent allowed Apr. 11, 1911.
C. S. Smith.....	Forest Service.....	Improvement in wood impregnation.	Patent allowed Apr. 24, 1911.
Harry D. Tiemann.....	do.....	Process for regulating and maintaining humidity.	Patent allowed Dec. 20, 1910.
Harry B. Shaw.....	Plant Industry.....	Camera support.	Pending.
Alexander G. McAdie..	Weather Bureau.....	Combination thermograph and hydrograph.	Patent allowed Oct. 7, 1910.
Harry D. Tiemann.....	Forest Service.....	Process of drying timber and other moisture-bearing substances.	Pending.
Alexander G. McAdie..	Weather Bureau.....	Barometer dial converter....	Do.
Frank M. Allen.....	Chemistry.....	Machine for testing life of typewriter ribbons.	Do.
L. W. Page and Allerton S. Cushman.	Public Roads.....	Process for mixing and preparing hydraulic cement concrete.	Application withdrawn and new application presented in name of L. W. Page; patent allowed to L. W. Page on May 17, 1911.
Harry D. Tiemann.....	Forest Service.....	Process of rapidly drying timber and other moisture-bearing substances.	Pending.
Do.....	do.....	Apparatus and process for controlling humidity of gases in drying operations.	Patent allowed July 12, 1910.
Charles H. Hoyt.....	Public Roads.....	Method of constructing macadam roads.	Pending.
Do.....	do.....	Prepared filler and binder for resurfacing parkways, etc.	Do.
William Brough.....	Animal Industry.....	Device for tattooing animals.	Patent allowed Apr. 21, 1911.
Wm. T. Conway.....	do.....	Device for stamping or marking meats.	Patent allowed May 27, 1911.
A. D. Melvin.....	do.....	do.....	Do.
Henry L. Walter and Chas. E. Goodrich.	Chemistry.....	Fat-extraction apparatus....	Pending.
Alexander G. McAdie..	Weather Bureau.....	Plant protector.....	Patent allowed May 3, 1911.

REPORT OF THE APPOINTMENT CLERK.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE APPOINTMENT CLERK,
Washington, D. C., September 11, 1911.

SIR: I have the honor to submit my annual report, respecting the personnel of the United States Department of Agriculture, consisting of statistical data, etc., as shown by the records of this office as they appeared on July 1, 1911.

Very respectfully,

R. W. ROBERTS,
Appointment Clerk.

Hon. JAMES WILSON,
Secretary of Agriculture.

INTRODUCTION.

During the past year several changes have been made with reference to the administration of the civil-service law, probably the most important of which was the establishment of what is known as the "district system," by dividing the States and Territories into 12 administrative districts and placing a secretary in charge of each. The object of this system is to facilitate the conduct of the business of the Civil Service Commission which pertains to the various Government departments outside of Washington. The different clerical and subclerical positions have already been placed under the district system. Should, for instance, the services of a clerk be required in any bureau of this department at San Francisco, Cal., a request for a certification of eligibles would be made directly to the district secretary by the local official in charge, who is authorized by the chief of the bureau to select from the certification issued to him by the district secretary, and to forward to the chief of the bureau the nomination of the person he has selected for appointment. This, of course, will obviously save a considerable amount of time in the selection of an appointee, as under the old system certification would be issued by the Commission at Washington, and selection and appointment made after correspondence with the eligibles residing in the vicinity in which the vacancy occurs, the correspondence often consuming considerable time. The district system does not include, however, the certification of scientific or other positions above the grade of clerk, certifications of eligibles for filling such positions being issued at the headquarters of the Civil Service Commission at Washington. It is believed that the new system, with

slight modifications to suit local conditions, will be of great benefit to the service. Comprehensive and explicit instructions will soon be issued to the field officials of the department, which will, no doubt, promote uniformity and economy in carrying on the business pertaining to the district system.

The following is a list of the 12 districts, giving the headquarters of each district:

First district, headquarters, post office, Boston, Mass.: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

Second district, headquarters, customhouse, New York, N. Y.: New York and the counties of Bergen, Essex, Hudson, Morris, Passaic, Sussex, and Union, in the State of New Jersey.

Third district, headquarters, post office, Philadelphia, Pa.: Pennsylvania, Delaware and the counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Ocean, Salem, Somerset, and Warren, in the State of New Jersey.

Fourth district, headquarters, office of Civil Service Commission, Washington, D. C.: Maryland, West Virginia, Virginia, North Carolina, and the District of Columbia.

Fifth district, headquarters, post office, Atlanta, Ga.: South Carolina, Georgia, Alabama, Florida, Mississippi, and Tennessee.

Sixth district, headquarters, post office, Cincinnati, Ohio: Ohio, Indiana, and Kentucky.

Seventh district, headquarters, post office, Chicago, Ill.: Wisconsin, Michigan, and the counties of Boone, Bureau, Carroll, Cook, De Kalb, Dupage, Ford, Grundy, Henderson, Henry, Iroquois, Jo Daviess, Kane, Kankakee, Kendall, Knox, Lake, LaSalle, Lee, Livingston, McHenry, Marshall, Mercer, Ogle, Peoria, Putnam, Rock Island, Stark, Stephenson, Warren, Whiteside, Will, Winnebago, and Woodford, in the State of Illinois.

Eighth district, headquarters, post office, St. Paul, Minn.: Minnesota, North Dakota, South Dakota, Nebraska, and Iowa.

Ninth district, headquarters, old customhouse, St. Louis, Mo.: Kansas, Missouri, Arkansas, Oklahoma, and the counties of Adams, Alexander, Bond, Brown, Calhoun, Cass, Champaign, Christian, Clark, Clay, Clinton, Coles, Crawford, Cumberland, Dewitt, Douglas, Edgar, Edwards, Effingham, Fayette, Franklin, Fulton, Gallatin, Greene, Hamilton, Hancock, Hardin, Jackson, Jasper, Jefferson, Jersey, Johnson, Lawrence, Logan, McDonough, McLean, Macon, Macoupin, Madison, Marion, Mason, Massac, Menard, Monroe, Montgomery, Morgan, Moultrie, Perry, Platt, Pike, Pope, Pulaski, Randolph, Richland, St. Clair, Saline, Sangamon, Schuyler, Scott, Shelby, Tazewell, Union, Vermilion, Wabash, Washington, Wayne, White, and Williamson, in the State of Illinois.

Tenth district, headquarters, customhouse, New Orleans, La.: Louisiana and Texas.

Eleventh district, headquarters, post office, Seattle, Wash.: Washington, Oregon, Idaho, Montana, and Wyoming (including the Yellowstone National Park).

Twelfth district, headquarters, post office, San Francisco, Cal.: California, Nevada, Arizona, New Mexico, Colorado, and Utah.

The departmental Committee on Efficiency and Economy made a report, with certain recommendations, which was approved by you under date of June 21, 1911. Among the recommendations of the committee was one relative to the change in the system of preparing all documents relating to appointments, promotions, transfers, and other changes affecting the personnel of the department. Consequent upon the recommendation of the committee and its approval by you, all actions mentioned above are now made on what is called a blanket sheet, and notifications of such actions, signed by the Appointment Clerk, sent to the persons affected by such changes. Heretofore individual papers were made in each case and signed by the Secretary or Acting Secretary. It is believed that the new system will result in a more economical and efficient administration of the affairs of this

office, and will certainly save the Secretary and Acting Secretaries many thousands of signatures in the course of a year. In adopting this system, the work of preparing the papers relating to appointments, transfers, promotions, etc., in the Bureau of Animal Industry and the Weather Bureau, which have heretofore been prepared in those bureaus, has been transferred to this office, thus centralizing all matters relating to appointments in the Office of the Appointment Clerk.

Another important change recommended by the committee and approved by you authorized the payment of all salaries on lump funds "from any lump fund of a bureau to which the salary is properly chargeable," instead of from specific lump-fund appropriations. In order to effectually carry out this recommendation of the committee, a special order was issued by you, under date of August 1, 1911, as follows:

SPECIAL ORDER.

AUGUST 1, 1911.

To the Chiefs of Bureaus, Offices, and Divisions:

Referring to the report of the Committee on Efficiency and Economy, approved June 21, 1911 (Appointments, sec. 8, p. 14), in which recommendation is made that all appointments, except those to statutory positions be made to read "payable from the lump appropriation (of the particular bureau) to which the salary is properly chargeable," it is hereby ordered that all appointments which have heretofore been payable from specific lump-fund appropriations be hereafter payable from any lump-fund appropriation of the bureau, office, or division to which the salary is properly chargeable, and that all future recommendations for appointment, payable from lump-fund appropriations, be prepared accordingly. All per diem appointments will hereafter be made for days actually employed.

JAMES WILSON,
Secretary of Agriculture.

The official register, which has heretofore been compiled in the various bureaus, offices, and divisions, is now prepared entirely in the Office of the Appointment Clerk.

I desire to record my appreciation of the hearty and efficient cooperation on the part of the working force of this office, which has been of inestimable value in carrying out the important changes enumerated above.

STATISTICAL INFORMATION.

The following statistical tables, relating to the personnel of the department and to various changes in the department, are self-explanatory:

Changes in the U. S. Department of Agriculture during the fiscal year 1910-11.

[From monthly reports to the Civil Service Commission.]

CLASSIFIED SERVICE.

Appointed for a probationary period of 6 months.....	1,163
Reinstated in the service within 1 year after separation therefrom.....	90
Transfers made within the department.....	274
Transferred from other departments of the Government to this department....	60
Promoted in salary.....	2,449
Reduced in salary.....	70
Temporary or emergency appointments for periods of 6 months or less.....	702
Temporary employments, for periods of 6 months or less, in the forests and fields and on stations in the various States outside of Washington, D. C....	3,419
Declined to accept appointment.....	77
Resigned their positions.....	694
Appointments terminated.....	212
Removed from the service because of their misconduct.....	42
Died while in the service.....	56
Temporary appointees whose services were terminated.....	435

CLASSIFIED SERVICE—POSITIONS EXCEPTED FROM EXAMINATION.

Appointed for temporary periods.....	2,234
Promoted in salary.....	134
Reduced in salary.....	41
Transfers made within the department.....	32
Separated from the service (through removal, resignation, or death).....	329
Appointments terminated.....	1,707
Temporary employments, for periods of 6 months or less, in the forests and fields and on stations in the various States outside of Washington, D. C....	1,398

UNCLASSIFIED SERVICE.

Appointments in the District of Columbia.....	39
Promotions in salary in the District of Columbia.....	27
Reductions in salary in the District of Columbia.....	3
Separations from the service in the District of Columbia.....	16
Appointments outside of Washington, D. C.....	270
Promotions in salary outside of Washington, D. C.....	16
Reductions in salary outside of Washington, D. C.....	1
Separations from the service outside of Washington, D. C.....	184
Temporary employments, for periods of 6 months or less, in the forests and fields and on stations in the various States outside of Washington, D. C....	¹ 41,494
Temporary or emergency appointments in the District of Columbia.....	58
Separations of temporary or emergency appointees in the District of Columbia.....	67
Miscellaneous (not covered by any of the above classes).....	88

Total number of changes reported.....	57,881
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¹ Including 33,709 fire fighters.

Males and females employed in the various bureaus, offices, divisions, and the Forest Service, in the U. S. Department of Agriculture, in and out of Washington, D. C., on July 1, 1911.

	In Washington.			Out of Washington.			Total.
	Males.	Females.	Total.	Males.	Females.	Total.	
Office of the Secretary.....	208	25	233	1	1	2	234
Weather Bureau.....	179	12	191	1,547	231	1,778	1,969
Bureau of Animal Industry.....	205	55	260	2,929	10	2,939	3,199
Bureau of Plant Industry.....	411	180	591	1,103	36	1,139	1,730
Forest Service.....	119	126	245	3,213	191	3,404	3,649
Bureau of Chemistry.....	187	52	239	242	31	273	512
Bureau of Soils.....	109	8	117	28	28	56	145
Bureau of Entomology.....	56	23	79	313	313	626	392
Bureau of Biological Survey.....	31	8	39	42	1	43	82
Division of Publications.....	89	102	191	191	191	382	572
Bureau of Statistics.....	44	48	92	63	1	64	156
Office of Experiment Stations.....	46	42	88	102	3	105	193
Library.....	5	22	27	27	27	54	81
Office of Public Roads.....	43	14	57	94	1	95	152
Division of Accounts and Disbursements.....	44	10	54	6	6	12	66
Insecticide board.....	11	11	22	2	2	4	26
Total, department.....	1,787	727	2,514	9,685	505	10,190	12,704

The above statement does not include the temporary employees appointed subsequent to January 1, 1911, nor temporary "field" employees.

Officers and employees of the department on statutory rolls and those paid from lump-sum funds, July 1, 1911.

Bureau, division, office, etc.	On statutory rolls.	On lump-sum funds.	Total.
Office of the Secretary.....	234	1	234
Weather Bureau.....	363	1,606	1,969
Bureau of Animal Industry.....	363	2,836	3,199
Bureau of Plant Industry.....	366	1,364	1,730
Forest Service.....	1,954	1,695	3,649
Bureau of Chemistry.....	222	290	512
Bureau of Soils.....	39	106	145
Bureau of Entomology.....	54	338	392
Bureau of Biological Survey.....	19	63	82
Division of Accounts and Disbursements.....	60	60	120
Division of Publications.....	191	191	382
Bureau of Statistics.....	91	65	156
Office of Experiment Stations.....	55	138	193
Library.....	25	2	27
Office of Public Roads.....	32	120	152
Insecticide Board.....	2	13	15
Total.....	4,068	8,636	12,704

Distribution, by States whence appointed, of employees of the United States Department of Agriculture, July 1, 1911.

State.	Branch of the Department.													
	Office of Secretary.	Weather Bureau.	Bureau of Animal Industry.	Bureau of Plant Industry.	Forest Service.	Bureau of Chemistry.	Bureau of Soils.	Bureau of Entomology.	Bureau of Biological Survey.	Division of Accounts and Disbursements.	Division of Publications.	Bureau of Statistics.	Office of Experiment Stations.	Library.
Alabama.....	2	30	7	94	9	2	8	1	1	1	1	3	1	1
Arizona.....		16		5	131	1	1		1	1	1	1	1	1
Arkansas.....		28	21	56	27	1	3			1	2	3	1	1
California.....		104	37	40	531	17		10	5	1	2	1	14	4
Colorado.....	1	58	24	13	270	2		7	3	1	1	2	6	1
Connecticut.....	2	15	21	9	46	20	1	2	1		3	1	4	1
Delaware.....	2	4	6	4	1	1		2			1	1		1
District of Columbia.....	87	50	66	173	76	48	18	20	2	4	37	13	17	6
Florida.....	2	32	2	26	7	3		1	5				3	1
Georgia.....	4	60	11	63	13	7	2	1			2	4		2
Idaho.....		26	2	5	321	1		1			1	2	3	
Illinois.....	4	59	448	34	46	30	6	3	2	5	9	10	4	1
Indiana.....	4	52	189	15	35	13	2	2	1	3	3	2	6	6
Iowa.....	6	57	184	33	38	9	3	1	3	3	11	5	12	7
Kansas.....	2	39	253	36	25	8	1	5	3	2	5	4	6	1
Kentucky.....	4	36	30	12	11	10	1	2		5	3	4	4	1
Louisiana.....	1	31	9	64	1	4		6	1	1	2	4	6	2
Maine.....	2	19	16	9	13	1		18				1		
Maryland.....	11	26	134	67	34	18	6	13	3	5	10	7	5	2
Massachusetts.....	4	41	180	25	57	32	6	105	4	4	3	5	6	4
Michigan.....	7	100	43	25	59	13	5	4	2	4	4	5	2	1
Minnesota.....	2	33	61	26	61	4	2	2	2	2	3	3	5	3
Mississippi.....	1	36	9	73	2	1	5	1	1		1	3		1
Missouri.....	6	47	319	28	19	14	9	4		1	5	4	4	4
Montana.....	1	42	2	8	382			9			1	2	6	2
Nebraska.....	3	27	125	31	42	7	1	4	1		1	5	7	1
Nevada.....		9		7	30	1		1				1	2	
New Hampshire.....		14	7	7	10	7	2	63			1	3		1
New Jersey.....	3	23	35	9	15	2		2	1	3		3	4	5
New York.....	12	99	254	63	82	61	11	15	10	4	14	8	7	2
New Mexico.....		22	12	5	155	1						1	1	2
North Carolina.....	1	40	14	62	17	7	13	1	1		7	3	1	1
North Dakota.....	1	21	7	17	5	6		2	4			1	2	1
Ohio.....	9	88	238	41	26	24	10	15		4	3	7	3	8
Oklahoma.....		20	29	46	23	6		1	1		2	2		
Oregon.....		77	6	10	286	3		6	7	1	1	1	2	1
Pennsylvania.....	14	68	137	30	63	45	10	14	1	6	11	7	4	10
Rhode Island.....		11	6	3	4	2	2	3		1	1	1		4
South Carolina.....	3	42	14	83	7	6	3	4		2	5	5	6	3
South Dakota.....		29	7	22	45	4					1	1		1
Tennessee.....	1	46	24	19	17	8		1		1	2	4	3	8
Texas.....	2	94	50	122	15	3		7			3	3	3	2
Utah.....	1	4	20	8	143	1	1	1			1	5	2	1
Virginia.....	19	54	23	130	27	21		10	3	3	12	6	4	4
Vermont.....	1	9	25	20	8	3		8			1	2	1	1
Washington.....		51	14	23	258	8	2	3	8		1	1	3	1
West Virginia.....	5	19	11	8	7		1	4	1	3	1	1		1
Wisconsin.....	4	35	55	15	34	9	9	1	2	6		1	7	1
Wyoming.....		12	9	1	106	1			2			1	8	1
Alaska.....		6			8									1
Porto Rico.....		1		1		1							2	
Hawaii.....			1	1	1	2							3	
Algeria.....				1		2								
Palestine.....				1										
Chile.....				1										
West Indies.....		7												
Alien.....			2				1	7	2					1
Total.....	234	1,969	3,199	1,730	3,649	512	145	392	82	60	191	156	193	27

Total distribution, by States whence appointed, of employees of the United States Department of Agriculture, July 1, 1911.

State.	Total.	State.	Total.
Alabama.....	160	New Jersey.....	117
Arizona.....	158	New York.....	657
Arkansas.....	143	New Mexico.....	199
California.....	765	North Carolina.....	172
Colorado.....	389	North Dakota.....	67
Connecticut.....	130	Ohio.....	476
Delaware.....	23	Oklahoma.....	130
District of Columbia.....	634	Oregon.....	401
Florida.....	82	Pennsylvania.....	421
Georgia.....	160	Rhode Island.....	38
Idaho.....	362	South Carolina.....	183
Illinois.....	662	South Dakota.....	110
Indiana.....	330	Tennessee.....	135
Iowa.....	372	Texas.....	304
Kansas.....	392	Utah.....	187
Kentucky.....	122	Virginia.....	319
Louisiana.....	132	Vermont.....	80
Maine.....	82	Washington.....	373
Maryland.....	345	West Virginia.....	61
Massachusetts.....	487	Wisconsin.....	181
Michigan.....	277	Wyoming.....	141
Minnesota.....	210	Alaska.....	15
Mississippi.....	134	Hawaii.....	8
Missouri.....	464	Porto Rico.....	5
Montana.....	455	Allen.....	23
Nebraska.....	255		
Nevada.....	51	Total.....	12,704
New Hampshire.....	115		

Officers and employees in the various bureaus, offices, divisions, and the Forest Service, and their classification.

	Com- peti- tive.	Excepted.						Un- classi- fied.	Total.
		Experts.	Agents.	Agents and ex- perts.	Collaborators.	Student assist- ant.	Forest guards.		
Office of the Secretary.....	187		1					42	1,234
Weather Bureau.....	763	2	2		1,179	6		17	1,969
Bureau of Animal Industry.....	2,896	20	143		7			133	3,199
Bureau of Plant Industry.....	586	53	389		474	38		190	1,730
Forest Service.....	2,790	31	7		22		745	34	3,649
Bureau of Chemistry.....	405	22	29		36			20	512
Bureau of Soils.....	111	1	6		23			4	145
Bureau of Entomology.....	192	27	36	45	12	6		74	392
Bureau of Biological Survey.....	29	10	39			2		2	82
Division of Publications.....	181							10	191
Bureau of Statistics.....	88		64					4	156
Office of Experiment Stations.....	136	13	31	2	2			9	193
Library.....	25					1		2	27
Office of Public Roads.....	74	13	57		1	1		6	152
Division of Accounts and Disbursements.....	60								60
Insecticide Board.....	10	1		1				1	13
Total department.....	8,533	193	824	48	1,756	53	745	548	12,704

¹ Includes the following presidential appointments: Secretary, Assistant Secretary, and two private secretaries.

² Includes special river observers, special cotton region observers, special meteorological observers, etc.

ESTABLISHMENT AND GROWTH OF THE DEPARTMENT OF AGRICULTURE.

The Department of Agriculture was established July 1, 1862, according to the provisions of an act approved May 15, 1862 (Stat. L., vol. 12, chap. 72, pp. 387, 388).

Growth of the force of the department from Sept. 30, 1863, to July 1, 1910.

Date.	Number employed.	Date.	Number employed.
1863, Sept. 30.....	29	1897, July 1.....	2,444
1867, Sept. 30.....	99	1899, July 1.....	2,965
1871, Sept. 30.....	84	1900, Nov. 16.....	3,128
1873, Sept. 30.....	92	1901, July 1.....	3,388
1875, Sept. 30.....	90	1902, July 1.....	3,789
1877, Sept. 30.....	77	1903, July 1.....	4,200
1879, June 30.....	93	1904, July 1.....	4,504
1881, July 1.....	108	1905, July 1.....	5,446
1883, July 1.....	239	1906, July 1.....	6,242
1885, July 1.....	214	1907, July 1.....	9,107
1887, July 1.....	328	1908, July 1.....	10,420
1889, July 1.....	488	1909, Mar. 4.....	10,280
1891, July 1 ¹	1,577	1909, July 1.....	11,140
1893, July 1.....	1,870	1910, July 1.....	12,480
1895, July 1.....	2,043	1911, July 1.....	12,704

¹ The large increase of July 1, 1891, resulted from the transfer of the Weather Bureau to the Department of Agriculture on that date.

COMMISSIONERS AND SECRETARIES OF AGRICULTURE.

Name and length of service of each Commissioner and of each Secretary of Agriculture since the organization of the United States Department of Agriculture, July 1, 1862.

Names.	Rank.	Appointed under the administration of President—	When appointed.	Service terminated.
Isaac Newton.....	Commissioner.....	Abraham Lincoln.....	July 1, 1862	June 19, 1867
John W. Stokes.....	do.....	Andrew Johnson.....	June 20, 1867	Dec. 4, 1867
Horace Capron.....	do.....	do.....	Dec. 5, 1867	July 31, 1871
Frederick Watts.....	do.....	Ulysses S. Grant.....	Aug. 1, 1871	June 30, 1877
Wm. G. Le Duc.....	do.....	Rutherford B. Hayes.....	July 1, 1877	June 30, 1881
Geo. B. Loring.....	do.....	James A. Garfield.....	July 1, 1881	Apr. 3, 1885
Norman J. Colman.....	do.....	Grover Cleveland.....	Apr. 4, 1885	Feb. 12, 1889
Do.....	Secretary.....	do.....	Feb. 13, 1889	Mar. 6, 1889
J. M. Rusk.....	do.....	Benjamin Harrison.....	Mar. 7, 1889	Mar. 6, 1893
J. Sterling Morton.....	do.....	Grover Cleveland.....	Mar. 7, 1893	Mar. 5, 1897
James Wilson.....	do.....	William McKinley.....	Mar. 6, 1897	.....
Do.....	do.....	do.....	Mar. 6, 1901	.....
Do.....	do.....	Theodore Roosevelt.....	Mar. 6, 1905	.....
Do.....	do.....	William H. Taft.....	Mar. 5, 1909	.....

Positions for which special competitive examinations were announced and held by the Civil Service Commission for the United States Department of Agriculture during the fiscal year ended June 30, 1911.

Agronomist in rice investigations.	Highway engineer.
Agronomist in grain investigations.	Hydro-electrical engineer.
Animal husbandman.	Inspector's assistant.
Apicultural assistant.	Investigator in poultry and egg handling.
Assistant chemical engineer in forest products.	Laboratory aid.
Assistant chemist.	Laboratory helper.
Assistant chemist in forest products.	Land law clerk.
Assistant director.	Lantern slide colorist.
Assistant in agricultural education.	Messenger.
Assistant in bacteriology.	Messenger boy (field service).
Assistant in dairy chemistry.	Meat inspector.
Assistant in farm accounting.	Mechanical and chart draftsman.
Assistant forest ranger.	Mechanician.
Assistant plant pathologist.	Microscopist in forest products.
Assistant engineer in forest products.	Microscope operator.
Assistant in tobacco investigations.	Mineral examiner.
Assistant in dairying.	Monotype machinist.
Assistant in corn investigations.	Plant ecologist.
Assistant in grain standardization.	Plant pathologist.
Assistant in dry-land agriculture.	Practical paper maker.
Assistant physiologist in plant nutrition.	Printer (Monotype operator).
Bacteriological chemist.	Preparator.
Botanical assistant.	Repairman.
Botanical translator.	Scientific assistant in forest distribution.
Chemist in forest products.	Scientific assistant in farm equipment.
Chemical engineer in forest products.	Scientific assistant in soil bacteriology.
Draftsman.	Scientific assistant in tobacco chemistry.
Drainage engineer.	Scientific assistant in wood utilization.
Editorial clerk.	Scientist in soil chemistry.
Entomological assistant.	Soil bibliographer.
Engineer in forest products.	Soil chemist.
Engineer-physicist.	Statistician in forest products.
Examiner U. S. Civil Service Commission.	Stenographer and typewriter (field service).
Farm superintendent.	Teacher of agriculture (Indian Service).
Forest clerk.	Telegraph operator.
Forest engineer.	Testing engineer.
Forest pathologist.	Typewriter.
Game-law clerk.	Veterinary inspector.
Grazing examiner.	Xylogotomist.

NOTE.—These examinations were held to fill vacancies as they occurred in the department for positions for which the Civil Service Commission does not maintain regular lists of eligibles.

Deaths in the department during the fiscal year ended June 30, 1911.

[Those marked * were stationed in Washington, D. C.]

Name.	State.	Position.	Bureau, division, or office.	Salary per annum.	Date of death.	Age.
Gregory Rodriguez.....	Tex...	Unskilled laborer.....	Plant Industry....	(1)	1909. Apr. 20	26
Lewis R. Baker.....	Wis...	Veterinary inspector.....	Animal Industry..	\$2,500	1910. July 2	47
Henry J. Daly.....	Conn.	Clerk.....	do.....	1,400	July 3	33
Louis J. Perry.....	S. C.	Collaborator.....	Plant Industry....	1	July 4	60
William H. Hazzard...	Colo.	Forest ranger.....	Forest Service....	1,300	do.....	37
Glen Z. Gunn.....	Ill.	Inspector's assistant.....	Animal Industry..	840	July 5	36
*Jane E. Eubank.....	Mo.	Clerk.....	Publications.....	720	do.....	51
*Ivy Virginia Hurdle...	Va....	do.....	Plant Industry....	800	July 14	34
Louis C. Miller.....	Okla.	Chief of the section of planting.	Forest Service....	1,900	July 16	36
James P. Steere.....	N. Y.	Meat inspector.....	Animal Industry..	1,000	July 21	40
C. C. Holland.....	Okla.	Clerk.....	do.....	1,400	July 22	56
John McCann.....	Nebr.	Inspector's assistant.....	do.....	1,000	July 24	52
Albert E. Leach.....	Mass.	Chief of the Denver laboratory.	Chemistry.....	3,000	Aug. 22	46
*Sylvester R. Burch...	Kans.	Chief clerk and custodian of buildings.	Office Secretary ...	3,000	do.....	68
Robert J. Hyatt.....	Mo....	Local forecaster.....	Weather.....	900	Aug. 23	53
Edward A. Anderson...	Ill.	Inspector's assistant.....	Animal Industry..	840	Aug. 28	27
Jacob W. Bauer.....	S. C.	Section director.....	Weather.....	1,400	Sept. 4	50
Harvey W. Jones.....	Tex...	Inspector's assistant.....	Animal Industry..	720	Sept. 11	30
*Mary Kelly.....	D. C.	Charwoman.....	Office Secretary ...	480	Sept. 17	47
*George W. Scheerer...	Ill.	Skilled laborer.....	Animal Industry..	660	Sept. 17	77
John E. Hart.....	Nebr.	do.....	do.....	900	Oct. 3	68
Amos Hedrick.....	Idaho.	Forest planting assistant..	Forest Service....	1,200	Oct. 16	34
Frank F. Brinkamp....	Wis...	Veterinary inspector.....	Animal Industry..	1,400	Oct. 30	25
William M. Aiken.....	Miss.	Law clerk (law officer and assistant to the Solicitor).	Office Secretary ...	2,000	Oct. 31	29
Frederick P. Travers...	Okla.	Stock examiner.....	Animal Industry..	900	Nov. 1	38
Arthur A. Harmon.....	Pa....	Veterinary inspector.....	do.....	1,600	Nov. 8	32
*Ernest L. Hammargren	Fla.	Clerk.....	Statistics.....	1,600	Nov. 10	50
James Sweet.....	Ill.	Meat inspector.....	Animal Industry..	1,000	Nov. 16	34
Denis McCarthy.....	N. Y.	do.....	do.....	1,000	Nov. 19	39
*Susan J. Miller.....	Pa....	Clerk.....	Publications.....	720	Nov. 27	62
Christian A. Herter....	N. Y.	Consulting scientific expert to the Secretary of Agriculture.	Chemistry.....	2,000	Dec. 5	45
Mary W. Taylor.....	Va....	Scientific library assistant.	do.....	1,800	Dec. 13	49
Frank Lee Marshall....	Mass.	Inspector's assistant.....	Animal Industry..	840	Dec. 19	39
James J. Gray.....	Cal....	Local forecaster.....	Weather.....	2,000	1911. Jan. 2	44
*Deborah G. Passmore.	Pa....	Clerk.....	Plant Industry....	1,400	Jan. 3	60
George D. Warner.....	Ohio.	Veterinary inspector.....	Animal Industry..	1,400	do.....	48
Harry H. Peregoy.....	Cal....	Forest ranger.....	Forest Service....	1,100	Jan. 4	41
James E. Baker.....	La....	Agent in tick eradication..	Animal Industry..	840	Jan. 19	54
*Willena Mozee.....	D. C.	Charwoman.....	Library.....	480	Jan. 26	44
John E. Dischner.....	Mo....	Meat inspector.....	Animal Industry..	1,000	Jan. 29	42
George W. Buckner...	Ind.	Veterinary inspector.....	do.....	1,400	do.....	47
John E. Moseley.....	Cal....	Assistant forest ranger.....	Forest Service....	1,100	Feb. 9	41
Frank J. Phillips.....	Mich.	Forest assistant.....	do.....	(2)	Feb. 13	29
Harry D. Freeman....	Kans.	Stock examiner.....	Animal Industry..	1,200	Feb. 22	37
S. A. McIntyre.....	Colo.	Forest guard.....	Forest Service....	900	Feb. 25	55
Robert H. Miller.....	Cal....	Deputy forest ranger.....	do.....	1,100	Feb. 27	45
Samuel Somerville, jr.	N. Y.	Veterinary inspector.....	Animal Industry..	1,400	Mar. 11	40
William B. Murdock...	Tenn.	Clerk.....	Forest Service....	900	Mar. 15	32
Seaman A. Knapp.....	La....	Special agent in charge of farmer's cooperative demonstration work.	Plant Industry....	4,000	Apr. 1	77
*Martha A. Goodchild..	D. C.	Clerk.....	Publications.....	1,000	Apr. 15	73
Maria Johnson.....	Va....	Laborer (unskilled).....	Plant Industry....	480	do.....	57
William E. Hedberg...	Mo....	Veterinary inspector.....	Animal Industry..	1,400	Apr. 20	33
*Maggie Quinn.....	Colo.	Folder.....	Publications.....	840	Apr. 21	50
Henry M. Mayer.....	Pa....	Veterinary inspector.....	Animal Industry..	1,400	Apr. 24	32
*Charles L. Gooch.....	D. C.	Gardener.....	Plant Industry....	840	Apr. 25	27
*Jesse H. Robinson...	N. J.	Chief of division.....	Weather.....	2,000	May 1	67
Herbert U. Spencer...	Kans.	Laboratory helper.....	Chemistry.....	720	May 2	25
John W. Sarsfield....	Ill.	Stock examiner.....	Animal Industry..	1,200	May 22	41
*Frederic C. Pratt.....	D. C.	Assistant entomologist.....	Entomology.....	1,600	May 27	41
George W. Brotherton.	Nev...	Forest ranger.....	Forest Service....	1,300	May 31	25
*John L. Reeves.....	D. C.	Laborer.....	Entomology.....	720	June 5	33
*Rosslyn J. Stafford...	N. Y.	Veterinary inspector.....	Animal Industry..	1,740	June 20	28
*William N. Irwin.....	N. Y.	Assistant in pomology.....	Plant Industry....	1,800	June 24	67
R. H. Mahana.....	Nebr.	Stock examiner.....	Animal Industry..	1,000	June 29	71

1 \$18.75 per month.

2 \$4 per day when employed.

List of principal officers United States Department of Agriculture, July 1, 1911.

OFFICE OF THE SECRETARY.

Name.	Official title or station.	Compensation per annum.
James Wilson.....	Secretary of Agriculture.....	\$12,000
Willet M. Hays.....	Assistant Secretary.....	5,000
George P. McCabe.....	Solicitor.....	5,000
Charles C. Clark.....	Chief clerk and custodian of buildings.....	3,000
Jasper Wilson.....	Private secretary to the Secretary of Agriculture.....	2,500
Robert M. Reese.....	Executive clerk.....	2,250
Alexander McC. Ashley.....	Inspector.....	2,500
R. W. Roberts.....	Appointment clerk.....	2,000
George W. Knorr.....	Private secretary to the Assistant Secretary of Agriculture.....	1,600
Cyrus B. Lower.....	Chief of Supply Division.....	2,000
Lewis Jones.....	Chief engineer and captain of the watch.....	1,800

WEATHER BUREAU.

Willis L. Moore.....	Chief of bureau.....	\$6,000
Henry E. Williams.....	Assistant chief.....	3,000
Daniel J. Carroll.....	Chief clerk and executive assistant.....	3,000
Prof. Harry C. Frankenfield ¹	Forecasting.....	3,500
Edward H. Bowie ¹	District forecaster.....	3,000
Prof. Harry C. Frankenfield.....	In charge of River and Flood Division.....	3,500
Prof. Charles F. Marvin.....	In charge of Instrument Division.....	3,500
Henry L. Heiskell.....	In charge of Division of Observations and Reports.....	2,500
Preston C. Day.....	In charge of Climatological Division.....	2,500
Edgar B. Calvert.....	In charge of Accounts Division.....	2,500
George E. Hunt.....	In charge of Observatory.....	1,800
CHIEFS OF DIVISION.		
John P. Church.....	Publications.....	2,000
Robert Seyboth.....	Supplies.....	2,000
Theodore T. Moore.....	Telegraph.....	2,000
Charles F. Talman.....	Librarian.....	2,000
IN CHARGE OF FORECAST DISTRICTS.		
Prof. Henry J. Cox ²	Chicago, Ill.....	3,500
Prof. Alexander G. McAdie ²	San Francisco, Cal.....	3,500
Frederick H. Brandenburg ²	Denver, Colo.....	2,400
Isaac M. Cline ²	New Orleans, La.....	2,400
Edward A. Beals ²	Portland, Oreg.....	2,400
J. Warren Smith.....	Professor of meteorology, Columbus, Ohio.....	2,500
DISTRICT FORECASTERS.		
John W. Smith.....	Boston, Mass.....	2,400
David Cuthbertson.....	Buffalo, N. Y.....	2,400
Ferdinand J. Walz ²	Louisville, Ky.....	2,400
James H. Scarr.....	New York, N. Y.....	2,400
Montrose W. Hayes ²	St. Louis, Mo.....	2,400
INSPECTORS.		
Norman B. Conger.....	Detroit, Mich.....	2,750
Henry B. Hersey.....	Milwaukee, Wis.....	2,750
CLIMATOLOGICAL EDITORS.		
Charles F. von Herrmann.....	Atlanta, Ga.....	2,000
George M. Chappel ²	Des Moines, Iowa.....	1,000
Bernard Bunnemeyer.....	Houston, Tex.....	2,000
Wilford M. Wilson.....	Ithaca, N. Y.....	2,000
Alfred H. Thiessen.....	Salt Lake City, Utah.....	1,800
STAFF OF THE MOUNT WEATHER OBSERVATORY.		
Prof. Alfred J. Henry.....	Executive officer.....	3,500
Prof. William J. Humphreys.....	Consulting physicist.....	3,500
Prof. Cleveland Abbe.....	Editor.....	2,500
Prof. Herbert H. Kimball.....	In charge of solar radiation work.....	2,500
William R. Blair.....	In charge of physical laboratory and upper air research.....	2,000

¹ Alternate monthly. ² Also climatological editor. ³ Receives additional compensation from State.

List of principal officers United States Department of Agriculture, July 1, 1911—Contd.

BUREAU OF ANIMAL INDUSTRY.

Name.	Official title or station.	Compensation per annum.
Alonzo D. Melvin.....	Chief of bureau.....	\$5,000
Arthur M. Farrington.....	Assistant chief.....	3,000
Charles C. Carroll.....	Chief clerk.....	2,500
CHIEFS OF DIVISION.		
George M. Rommel.....	Division of Animal Husbandry.....	3,000
Marion Dorset.....	Biochemic Division.....	4,000
B. H. Rawl.....	Dairy Division.....	3,000
Rice P. Steddom.....	Inspection Division.....	3,500
John R. Mohler.....	Pathological Division.....	4,000
R. W. Hickman.....	Quarantine Division.....	3,000
Brayton H. Ransom.....	Zoological Division.....	2,750
James M. Pickens.....	Editor and compiler.....	2,250
E. C. Schroeder.....	Superintendent of experiment station.....	3,250

BUREAU OF PLANT INDUSTRY.

ADMINISTRATION.		
Beverly T. Galloway.....	Pathologist and physiologist and chief of bureau.....	\$5,000
William A. Taylor.....	Pomologist and assistant chief of bureau.....	4,000
James E. Jones.....	Chief clerk.....	2,250
J. E. Rockwell.....	Editor.....	2,000
W. P. Cox.....	Officer in charge of records.....	2,000
PATHOLOGY.		
Erwin F. Smith.....	Pathologist in charge of laboratory of plant pathology.....	4,000
Haven Metcalf.....	Pathologist in charge of laboratory of forest pathology.....	2,700
William A. Orton.....	Pathologist in charge of cotton and truck crop diseases and sugar-plant investigations.....	2,750
Merton B. Waite.....	Pathologist in charge of fruit disease investigations.....	3,000
PHYSIOLOGY.		
Walter T. Swingle.....	Physiologist in charge of crop physiology and breeding investigations.....	3,240
Karl F. Kellerman.....	Physiologist in charge of soil bacteriology and water-purification investigations.....	2,500
O. F. Cook.....	Bionomist in charge of crop acclimatization and adaptation investigations.....	3,000
Rodney H. True.....	Physiologist in charge of drug-plant, poisonous-plant, and tea-culture investigations.....	3,000
TECHNOLOGY.		
Nathan A. Cobb.....	Agricultural technologist in charge of crop-technology investigations.....	3,240
Lyster H. Dewey.....	Botanist in charge of fiber investigations.....	2,700
J. W. T. Duvel.....	Crop technologist in charge of grain standardization.....	2,400
Lyman J. Briggs.....	Physicist in charge of physical investigations.....	3,000
Edgar Brown.....	Botanist in charge of seed laboratory.....	2,500
AGRONOMY.		
Mark A. Carleton.....	Cerealist in charge of grain investigations.....	3,240
W. W. Garner.....	Physiologist in charge of tobacco and nutrition investigations.....	2,160
Thomas H. Kearney.....	Physiologist in charge of alkali and drought resistant plant breeding investigations.....	2,760
Charles P. Hartley.....	Physiologist in charge of corn investigations.....	2,000
Frederick V. Coville.....	Botanist in charge of taxonomic and range investigations.....	3,500
E. C. Chilcott.....	Agriculturist in charge of dry land agriculture investigations.....	3,000
C. V. Piper.....	Agrostologist in charge of forage-crop investigations.....	3,000
DEMONSTRATIONS.		
W. J. Spillman.....	Agriculturist in charge of farm-management investigations.....	4,000
Bradford Knapp.....	Special agent in charge of farmers' cooperative demonstration work.....	3,500
Carl S. Scofield.....	Agriculturist in charge of western agricultural extension.....	3,000

List of principal officers United States Department of Agriculture, July 1, 1911—Contd.

BUREAU OF PLANT INDUSTRY—Continued.

Name.	Official title or station.	Compensation per annum.
HORTICULTURE.		
G. B. Brackett.....	Pomologist in charge of pomological collections.....	\$3,240
A. V. Stubenrauch.....	Expert in charge of field investigations in pomology..	2,750
E. M. Byrnes.....	Assistant in charge of pathological and physiological plant houses and department grounds.	2,160
L. C. Corbett.....	Horticulturist in charge of Arlington Farm and Horticulture.	3,240
W. W. Tracy, sr.....	Superintendent of vegetable-testing gardens.....	3,000
FIELD GARDENS.		
Edward C. Green.....	Pomologist in charge of South Texas Garden, Brownsville, Tex.	2,280
SEEDS.		
Leon M. Estabrook.....	Assistant in general charge of seed distribution.....	2,250
David Fairchild.....	Agricultural explorer in charge of foreign seed and plant introduction.	3,000
FOREST SERVICE.		
Henry S. Graves.....	Forester and Chief.....	\$5,000
Albert F. Potter.....	Associate forester.....	4,000
Herbert A. Smith.....	Editor.....	3,000
Finley Burns.....	Chief of publication.....	2,000
George B. Sudworth.....	Dendrologist.....	3,000
Daniel D. Bronson.....	General inspector.....	2,500
OFFICE OF ACCOUNTS, FOREST SERVICE BRANCH.		
Mathias E. Fagan.....	Chief.....	2,500
Ernest A. Melzar.....	Assistant Chief.....	2,000
BRANCH OF OPERATION.		
James B. Adams.....	Assistant forester in charge.....	3,500
Franklin W. Reed.....	Forest inspector.....	2,500
George G. Anderson.....	Assistant in office methods.....	2,100
Fred G. Plummer.....	Chief, Office of Geography.....	2,700
George A. Bentley.....	Chief, Office of Maintenance.....	1,600
BRANCH OF SILVICULTURE.		
Wm. B. Greeley.....	Assistant forester in charge.....	3,000
Earle H. Clapp.....	Forest inspector.....	2,500
OFFICE OF STATE AND PRIVATE COOPERATION.		
J. Girven Peters.....	Chief.....	2,000
J. Harold Foster.....	Assistant Chief.....	1,700
OFFICE OF SILVICS.		
Raphael Zon.....	Chief.....	2,500
Samuel T. Dana.....	Assistant Chief.....	1,800
Louis S. Murphy.....	In charge, Office of Forest Management.....	1,800
BRANCH OF GRAZING.		
Albert F. Potter.....	Associate forester in charge.....	4,000
Leon F. Kneipp.....	Assistant forester.....	2,800
Will C. Barnes.....	Inspector of grazing.....	2,700
BRANCH OF LANDS.		
James B. Adams.....	Assistant forester in charge.....	3,500
Charles H. Squire.....	In charge, Office of Occupancy.....	2,000
James I. Parker.....	Chief, Office of Claims.....	2,750
BRANCH OF PRODUCTS.		
McGarvey Cline.....	Director (Madison, Wis.).....	2,500
H. Stanley Bristol.....	Assistant director.....	2,000
Howard F. Weiss.....	do.....	2,200

List of principal officers United States Department of Agriculture, July 1, 1911—Contd.

FOREST SERVICE—Continued.

Name.	Official title or station.	Compensation per annum.
OFFICE OF WOOD UTILIZATION (CHICAGO, ILL.).		
Homer S. Sackett.....	Chief.....	\$2,000
O. T. H. Swan.....	In charge Washington office.....	1,800
ACQUISITION OF LAND UNDER THE WEEKS LAW.		
Wm. L. Hall.....	Assistant forester in charge.....	3,250
Clyde Leavitt.....	Forest inspector.....	2,500
DISTRICT OFFICES.		
District 1, Missoula, Mont.:		
Ferdinand A. Silcox.....	District forester.....	2,500
Edwin W. Kramer.....	District engineer.....	2,100
John F. Preston.....	Office of operation, assistant district forester.....	2,000
Robert Y. Stuart.....	Office of silviculture, assistant district forester.....	2,200
Charles H. Adams.....	Office of grazing, assistant district forester.....	2,200
Richard H. Rutledge.....	Office of lands, assistant district forester.....	2,200
Percy R. Hicks.....	Office of products, in charge.....	1,500
District 2, Denver, Colo.:		
Smith Riley.....	District forester.....	2,800
Theodore W. Norcross.....	District engineer.....	2,400
Fred W. Morrell.....	Office of operation, assistant district forester.....	2,200
Sydney L. Moore.....	Office of silviculture, assistant district forester.....	2,200
Jesse W. Nelson.....	Office of grazing, assistant district forester.....	2,200
Carl J. Stahl.....	Office of lands, assistant district forester.....	2,200
Harold S. Betts.....	Office of products, assistant district forester.....	2,200
District 3, Albuquerque, N. Mex.:		
Arthur C. Ringland.....	District forester.....	2,700
Alpheus O. Waha.....	Office of operation, assistant district forester.....	2,200
Theo. S. Woolsey, jr.....	Office of silviculture, assistant district forester.....	2,400
John Kerr.....	Office of grazing, assistant district forester.....	2,200
Frank C. W. Pooler.....	Office of lands, assistant district forester.....	2,200
District 4, Ogden, Utah:		
Edward A. Sherman.....	District forester.....	2,800
Arthur C. McCain.....	Office of operation, assistant district forester.....	2,200
Ovid M. Butler.....	Office of silviculture, assistant district forester.....	2,000
Homer E. Fenn.....	Office of grazing, assistant district forester.....	2,200
Timothy C. Hoyt.....	Office of lands, assistant district forester.....	2,200
A. Mark Smith.....	Supply depot, property clerk.....	2,000
Joseph G. Falck.....	Property auditor.....	1,800
District 5, San Francisco, Cal.:		
Coert Du Bois.....	Acting district forester.....	2,400
Walter L. Huber.....	District engineer.....	2,400
Roy Headley.....	Office of operation, assistant district forester.....	2,200
Trueman D. Woodbury.....	Office of silviculture, assistant district forester.....	2,200
John H. Hatton.....	Office of grazing, assistant district forester.....	2,300
Louis A. Barrett.....	Office of lands, assistant district forester.....	2,200
C. Stowell Smith.....	Office of products, assistant district forester.....	2,200
District 6, Portland, Oreg.:		
George H. Cecil.....	District forester.....	2,500
W. E. Herring.....	District engineer.....	2,600
Charles H. Flory.....	Office of operation, assistant district forester.....	2,200
Fred E. Ames.....	Office of silviculture, assistant district forester.....	2,200
Thomas P. MacKenzie.....	Office of grazing, assistant district forester.....	2,000
Clarence J. Buck.....	Office of lands, assistant district forester.....	2,200
Joseph B. Knapp.....	Office of products, assistant district forester.....	2,200

BUREAU OF CHEMISTRY.

H. W. Wiley.....	Chemist and Chief of Bureau.....	\$5,000
F. L. Dunlap.....	Associate chemist.....	4,000
W. D. Bigelow.....	Assistant Chief of Bureau and Chief of Division of Foods.....	4,000
F. B. Linton.....	Chief clerk.....	2,000
A. L. Pierce.....	Editor.....	1,800
A. E. Draper.....	Librarian.....	1,800
DIVISION OF FOODS.		
W. D. Bigelow.....	Chief of division.....	4,000
L. M. Tolman.....	Chief, Food Inspection Laboratory.....	3,000
E. M. Chace.....	Chief, Food Technology Laboratory and Assistant Chief of Division.....	2,760
H. S. Bailey.....	Chief, Oil, Fat, and Wax Laboratory.....	1,800

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BUREAU OF CHEMISTRY—Continued.

Name.	Official title or station.	Compensation per annum.
DIVISION OF DRUGS.		
L. F. Kebler.....	Chief of division.....	\$3,500
G. W. Hoover.....	Chief, Drug Inspection Laboratory.....	2,040
W. O. Emery.....	Chief, Synthetic Products Laboratory.....	2,280
William Salant.....	Chief, Pharmacological Laboratory.....	2,760
FOOD AND DRUG INSPECTION.		
W. G. Campbell.....	Chief inspector.....	2,760
MISCELLANEOUS DIVISION.		
J. K. Haywood.....	Chief of division.....	3,250
W. W. Skinner.....	Chief, Water Laboratory.....	2,520
G. L. Bidwell.....	Acting Chief, Cattle Food and Grain Laboratory.....	1,620
C. C. McDonnell.....	Chief, Insecticide and Fungicide Laboratory.....	2,200
CONTRACTS LABORATORY.		
P. H. Walker.....	Chief.....	2,760
DAIRY LABORATORY.		
G. E. Patrick.....	Chief.....	2,760
LEATHER AND PAPER LABORATORY.		
F. P. Veitch.....	Chief.....	2,760
MICROCHEMICAL LABORATORY.		
B. J. Howard.....	Chief.....	2,520
SUGAR LABORATORY.		
A. H. Bryan.....	Chief.....	2,520
NITROGEN SECTION.		
T. C. Trescot.....	In charge.....	2,760
FOOD RESEARCH LABORATORY.		
M. E. Pennington.....	Chief.....	3,000
SPECIAL INVESTIGATIONS.		
C. S. Hudson.....	Chief, physical chemistry.....	2,250
F. C. Weber.....	In charge, physiological chemistry (animal).....	2,520
J. A. Le Clerc.....	In charge, physiological chemistry (plant).....	2,760
G. W. Stiles, jr.....	In charge, bacteriological chemistry.....	2,280
Wm. B. Alwood.....	In charge, enological chemistry.....	2,280
FOOD AND DRUG INSPECTION LABORATORIES.		
B. H. Smith.....	Chief, Boston, Mass.....	2,760
W. L. Du Bois.....	Chief, Buffalo, N. Y.....	2,250
A. L. Winton.....	Chief, Chicago, Ill.....	3,500
B. R. Hart.....	Chief, Cincinnati, Ohio.....	2,040
R. S. Hiltner.....	Chief, Denver, Colo.....	2,280
H. L. Schulz.....	Chief, Detroit, Mich.....	2,040
T. F. Pappe.....	Chief, Galveston, Tex.....	1,800
E. B. Blanchard.....	Acting chief, Honolulu, Hawaii.....	1,500
F. W. Liepner.....	Chief, Kansas City, Mo.....	2,040
R. W. Balcom.....	Chief, Nashville, Tenn.....	2,040
W. J. McGee.....	Chief, New Orleans, La.....	1,600
R. E. Doolittle.....	Chief, New York, N. Y.....	3,500
S. H. Ross.....	Chief, Omaha, Nebr.....	2,040
C. S. Brinton.....	Chief, Philadelphia, Pa.....	2,280
M. C. Albrech.....	Chief, Pittsburgh, Pa.....	1,800
A. L. Knisely.....	Chief, Portland, Oreg.....	2,040
D. B. Bisbee.....	Chief, St. Louis, Mo.....	2,040
A. S. Mitchell.....	Chief, St. Paul, Minn.....	3,000
R. A. Gould.....	Chief, San Francisco, Cal.....	3,000
W. C. Burnet.....	Chief, Savannah, Ga.....	2,040
H. M. Loomis.....	Chief, Seattle, Wash.....	2,250

List of principal officers United States Department of Agriculture, July 1, 1911—Contd.

BUREAU OF CHEMISTRY—Continued.

Name.	Official title or station.	Compensation per annum.
REFEREE BOARD.		
Dr. Ira Remsen.....	Consulting scientific expert to the Secretary of Agriculture and chairman of the Referee Board.	\$2,000
Dr. Russell H. Chittenden.....	Consulting scientific expert to the Secretary of Agriculture.	2,000
Dr. Theobald Smith.....	do.....	2,000
Dr. John B. Long.....	do.....	2,000
Dr. Alonzo E. Taylor.....	do.....	2,000

BUREAU OF SOILS.

Milton Whitney.....	Chief of Bureau.....	\$4,000
A. G. Rice.....	Chief clerk.....	2,000
Geo. W. Baumann.....	Executive assistant.....	2,000
SOIL LABORATORY INVESTIGATIONS.		
Frank K. Cameron.....	Scientist.....	3,750
Oswald Schreiner.....	do.....	3,500
R. B. Moore.....	do.....	3,000
E. C. Shorey.....	do.....	2,500
M. X. Sullivan.....	do.....	2,220
G. H. Failyer.....	do.....	2,000
H. E. Patten.....	do.....	2,000
J. W. Turrentine.....	do.....	2,000
INVESTIGATIONS OF FERTILIZER RESOURCES.		
Edward E. Free.....	Scientist.....	2,500
SOIL SURVEY.		
Curtis F. Marbut.....	Scientist.....	3,250
J. A. Bonsteel.....	do.....	3,250
W. J. McGee.....	Expert.....	3,000
H. H. Bennett.....	Scientist.....	2,040
J. E. Lapham.....	do.....	2,040
Macy H. Lapham.....	do.....	2,000
W. G. Smith.....	do.....	2,000

BUREAU OF ENTOMOLOGY.

L. O. Howard.....	Entomologist and Chief.....	\$4,500
C. L. Marlatt.....	Entomologist and Acting Chief in absence of Chief...	3,500
R. S. Clifton.....	Executive assistant.....	2,250
W. F. Tastet.....	Chief clerk.....	1,800
F. H. Chittenden.....	In charge of truck crop and stored product insect investigations.	3,000
A. D. Hopkins.....	In charge of forest insect investigations.....	3,000
W. D. Hunter.....	In charge of southern field crop insect investigations..	3,000
F. M. Webster.....	In charge of cereal and forage insect investigations.....	3,000
A. L. Quaintance.....	In charge of deciduous fruit insect investigations.....	3,000
E. F. Phillips.....	In charge of bee culture.....	2,750

BUREAU OF BIOLOGICAL SURVEY.

H. W. Henshaw.....	Biologist and Chief of Bureau.....	\$3,500
C. Hart Merriam.....	Consulting biologist.....	1,000
T. S. Palmer.....	Assistant chief and in charge of game preservation....	3,250
A. K. Fisher.....	Assistant in charge of economic investigations.....	3,000
Vernon Bailey.....	Assistant in charge of biological investigations.....	3,000
A. B. Morrison.....	Chief clerk.....	1,800

DIVISION OF PUBLICATIONS.

Jos. A. Arnold.....	Editor and Chief.....	\$3,250
B. D. Stallings.....	Editor and Assistant Chief.....	2,250
A. I. Mudd.....	Chief clerk.....	2,000
F. J. P. Cleary.....	Assistant in charge of document section.....	2,000
L. S. Williams.....	Assistant in charge of illustrations.....	2,000
C. H. Greathouse.....	Assistant in charge of indexing.....	2,000

List of principal officers United States Department of Agriculture, July 1, 1911—Contd.

BUREAU OF STATISTICS.

Name.	Official title or station.	Compensation per annum.
Victor H. Olmsted.....	Statistician and Chief of Bureau.....	\$4,000
Nat C. Murray.....	Associate statistician.....	3,000
Samuel A. Jones.....	Assistant statistician.....	2,500
Frank G. Kelsey.....	Chief clerk.....	1,800
George K. Holmes.....	Chief of Division of Production and Distribution.....	3,000
Charles M. Daugherty.....	Chief of Division of Reference and Research.....	2,500
Fred J. Blair.....	Chief of Division of Domestic Crop Reports.....	2,500

OFFICE OF EXPERIMENT STATIONS.

A. C. True.....	Director.....	\$4,500
E. W. Allen.....	Assistant Director, and editor of Experiment Station Record.....	3,500
Mrs. C. E. Johnston.....	Chief clerk.....	2,000
W. H. Beal.....	Chief of Editorial Division.....	2,700
Walter H. Evans.....	Chief of Division of Insular Stations.....	2,700
Samuel Fortier.....	Chief of Irrigation Investigations.....	3,750
C. G. Elliott.....	Chief of Drainage Investigations.....	3,750
C. C. Georgeson.....	In charge of Alaska experiment stations.....	3,000
J. B. Thompson.....	In charge of Guam experiment stations.....	2,500
E. V. Wilcox.....	In charge of Hawaii experiment stations.....	3,000
D. W. May.....	In charge of Porto Rico experiment stations.....	3,000
C. F. Langworthy.....	In charge of nutrition investigations.....	2,500
F. E. Singleton.....	In charge of accounts.....	2,000
D. J. Crosby.....	Specialist in agricultural education.....	2,400
John Hamilton.....	Specialist in farmers' institutes.....	2,250

LIBRARY.

Claribel R. Barnett.....	Librarian.....	\$2,000
Emma B. Hawks.....	Assistant Librarian.....	1,400

OFFICE OF PUBLIC ROADS.

Logan Waller Page.....	Director.....	\$4,000
Paul D. Sargent.....	Assistant Director.....	3,000
Vernon M. Pierce.....	Chief engineer.....	3,000
Prevost Hubbard.....	Chemist.....	2,500
Charles H. Hoyt.....	Bridge engineer.....	2,700
Charles S. Reeve.....	Assistant chemist.....	2,000
M. O. Eldridge.....	Assistant in road management.....	2,000
Albert T. Goldbeck.....	Testing engineer.....	1,800
Edwin C. E. Lord.....	Petrographer.....	1,600
William W. Sniffin.....	Editorial clerk and librarian.....	1,600
W. Carl Wyatt.....	Chief clerk.....	1,800

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

A. Zappone.....	Chief of Division and disbursing clerk.....	\$3,750
E. B. Calvert.....	Assistant Chief.....	2,500
M. E. Fagan.....	Chief of Office of Accounts and fiscal agent.....	2,500
E. D. Yerby.....	Supervising auditor.....	2,250
W. J. Nevius.....	Cashier and chief clerk.....	2,000
F. W. Legge.....	Accountant.....	2,000
E. E. Forbes.....	Auditor.....	2,000
W. R. Fuchs.....	Deputy disbursing clerk.....	2,000
E. A. Melzar.....	District fiscal agent.....	2,000
A. H. Cousins.....	do.....	2,000
Q. R. Craft.....	do.....	2,000
J. J. Duffy.....	do.....	2,000
H. I. Loving.....	do.....	2,000
F. C. Thompson.....	do.....	2,000
J. A. Urbanowicz.....	do.....	2,000
C. W. Taylor.....	Supervising bookkeeper.....	1,800

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